North American Telecommunications Association

1983-1984 TELECOMMUNICATIONS

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Foreword

The *1983 Telecommunications Equipment Industry Statistical Review* is designed to provide a coherent and up-to-date picture of the business telephone equipment market in the U.S. The findings contained herein are based on the best available data and a set of assumptions derived from actual trends and developments as observed by a wide range of industry participants.

The *1983 Review* differs from earlier editions in two significant ways. First, NATA has revised its previous assumptions and projections, a reappraisal necessitated principally by the divesture of the Bell System. Second, information contained in the *Review* has been reorganized into six sections: Industry Outlook, Key Market, PBX-Centrex Market, Competitive Markets, General Reference, and Glossary. We believe the new format will help the reader make better use of the statistical material.

This year's *Review* also contains material prepared by The Eastern Management Group which updates two charts that appeared in the *1982 Review*. The tables showing "Geographical Penetration of the PBX Market: Bell vs. Interconnect" and "PBX Distribution by City: 1982" appear on pages 121 and 122.

Major sources of NATA's study have been FCC and United States Independent Telephone Association (USITA) statistics. In addition, NATA has conducted an informal survey of a wide range of industry participants in an effort to round out our picture of the interconnect side of the industry. Finally, NATA researchers reviewed a wide range of recent industry studies and consulted a number of independent analysts to ensure no significant aspects of the industry were overlooked. While these studies and independent experts were extremely helpful, the data and assumptions contained in this *Review* are entirely those of NATA.

David Keeler
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August 1983

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1983 Telecommunications Equipment Statistical Review: Industry Outlook

The business telecommunications equipment market in 1983 continues to be shaped by three principal forces: restructuring of the market mandated by recent FCC and court actions (see box); technological innovation and the resulting turnover of the base of in-place equipment; and continued fierce price competition in the market.

Changes in Industry Structure

The widespread confusion which characterized the industry last year has begun to subside as details of the divestiture plan become clear and as the economy shows increasing signs of recovery. Although AT&T launched its new unregulated subsidiary (initially named American Bell and recently renamed AT&T Information Systems) with a fanfare of promotion, the company's performance to date has been unimpressive. Problems and delays with the Dimension System 85, AT&T's first digital PBX offering; initial high prices on all products; confusion over sales versus lease options; and a relatively inexperienced sales force have resulted in a slower takeoff than many analysts predicted. The Western Electric/American Bell reorganization and the departure of Archie McGill (former president of American Bell) are symptomatic of these problems, but it seems doubtful that corporate restructuring and personnel changes alone can compensate for an inconsistent product line and a weak sales force.

Western Electric Company (WECo) and AT&T are expected to continue to lose market share through 1985-86. In part, this loss continues recent trends and reflects an apparently greater than expected loss of customers due to the Migration Strategy (see Glossary). AT&T's loss of market share also results from product weakness, particularly in key systems. Finally, Western Electric lost a potent market presence when it switched from the Bell Operating Companies to AT&T as its primary market outlet.

By late 1984 or early 1985, however, AT&T generally is expected to emerge as an aggressive competitor in the marketplace. The BOCs are also expected to emerge as aggressive competitors. They will probably handle equipment from a variety of manufacturers rather than maintain their historic relationship with Western Electric. Indeed, at the residential level, the BOCs may surpass AT&T/Western Electric as the dominant market suppliers.

Two recent developments closely related to the divestiture and deregulation processes will have tremendous impact on the market over the next few years. First was the FCC announcement in July that access charges will be assessed directly on Centrex CO lines in 1984. All Centrex CO systems in-place or on order as of July 27, 1983, will be charged at the residential rate, beginning at $2 per line per month in 1984. All systems ordered after July 27th will be charged the normal business rate, which starts at $6 per line per month. If the FCC's decision stands, the carriers are certain to explore rate reductions and other means of offsetting these charges; the decision is expected to weaken Centrex CO as a viable market option. The change-out by customers moving from Centrex CO to PBX is expected to stimulate PBX sales through 1985, especially at the large end of the market. While all vendors will benefit from this stimulus, AT&T is expected to pick up over half of the customers leaving large Centrex CO systems.

The second development results from AT&T's announced plans to sell in-place 1A2 (electromechanical) key systems to current users. According to AT&T's plan, 1A2 key sets installed behind PBX and Centrex will be offered for sale beginning in the fourth quarter of 1984, with stand-alone 1A2 key systems to be available sometime later, probably around mid-1985. This projected sell-off of in-place AT&T equipment will affect the interconnect industry in a number of ways. First, a significant number of customers presently using stand-alone Western Electric 1A2 key systems are expected to upgrade their systems when presented a purchase option and price by AT&T, creating a temporary upsurge in key sales for interconnect vendors in 1985. Second, interconnect contractors are expected to pick up service and maintenance on over two million 1A2 sets after they are purchased by the current users. This development will tremendously increase industry revenues from non-sales sources. Third, the massive shift of 1A2 equipment to customers (NATA estimates AT&T's embedded base at 19 million) will probably depress key sales in 1986 and 1987. Sales should increase significantly after 1987, however, as customers who purchased their in-place equipment begin to upgrade.

Technological Innovation

The current cycle of technology-induced change-out from electromechanical to fully electronic and programmable PBX and key systems is nearing its end, with the next cycle expected to pick up around 1987-88. The next generation of PBX products, with design-inherent simultaneous voice and data capabilities and possibly LAN-associated characteristics, is taking longer to reach the market than many analysts initially predicted. Software development in particular has proved more time consuming and costly than expected. At the same time, data applications still account for less than 10 percent of business telephone usage, and there are no clear indications these applications will accelerate dramatically in the immediate future. Most users will put off an upgrade to a fully-integrated system until their data requirements demand it and the new products have proven themselves in the market. This transition from second to third generation products will probably be extended through the use of add-on enhancements providing data capabilities in today's switches. Shipments of true design-inherent third generation products will become significant around 1985, though large volume is not expected to be reached before 1987.

Reported interconnect sales and revenues for 1982 were about 15 percent

higher than had been projected, though performance was mixed, with large, well-financed companies generally reporting fairly strong activity while many other companies reported stagnant conditions. A firm's ability to offer attractive financing terms in the face of continued high capital costs seems to have been the deciding factor in most cases.

The equipment market is showing increasing resilience with an upsurge of bid-requests for very large systems (over 500 lines) and a flurry of activity targeted at the very small system (below 12 lines) user. While the mid-range 100 to 400 line size PBX market is nearing saturation, the continued decline of Centrex is expected to drive sales at the high end of the market, while new products and enhanced applications will stimulate activity at the low end.

Price Competition

The most volatile characteristic of the telecommunications equipment industry today is the rampant price competition resulting from an overabundance of vendors. The larger and more aggressive vendors are moving to establish a solid customer base as a foundation for long-term service and follow-up sales revenue. As a result, average prices for new equipment have dropped by almost 15 percent since 1980 and have created a severe financial squeeze on smaller and less well capitalized companies. This situation is evident from the large number of departures and acquisitions the industry has seen over the past few years.

The more forward-looking vendors are focusing on revenues from sources other than new sales of primary equipment (PBX and key). Revenues from maintenance, moves and changes, and from follow-up sales of peripheral equipment (call accounting systems, auto dialers, headsets, and data equipment) are growing at a faster rate than are new sales. Profitable service and peripheral offerings will be vital to the financial health of vendors during the projected period.

Despite the ongoing trend of vendor concentration, the interconnect industry is still characterized by a large number of small firms. The total universe of business telephone equipment vendors probably includes 2,000 to 2,500 companies in the U.S., including those whose primary business activity may be sound systems and/or intercom. The average interconnect vendor today has been in business seven to 10 years; has 15 to 20 employees, including five to six salespeople; sees annual revenues in the $1 million to $5 million range; and deals primarily in key equipment.

Summary of NATA Projections

The following summarizes NATA's projections for interconnect industry development in the next five years:

- Installed base growth of key instruments will average 28.7% between 1983 and 1987, down from 33.8% between 1978 and 1982.
- Market share of key instruments will increase to 32.3% in 1987, up from 12.2% in 1982.
- Installed base growth of PBX instruments will average 17.3% between 1983 and 1987, down from 22.8% between 1978 and 1982.
- Market share of PBX instruments will increase to 46.6% in 1987, up from 31.3% in 1982.
- Growth in annual revenues from primary sales to end-users will average 18.1% between 1983 and 1987.
- Growth in annual revenues from other sources (service and sales of add-on equipment, such as data terminals, to established customers) will average 25.2% between 1983 and 1987.
- Growth in total revenues will average 19.7% between 1983 and 1987.
- Revenues from other sources as a percentage of total revenues will increase to 26.0% in 1987, up from 20.7% in 1982.

The following summarizes NATA's projections for independent manufacturers' development in the next five years:

- Total growth in key shipments will average 4.3% through 1987, down from 7.05% between 1978 and 1982. By 1987, independent manufacturers will see their market share increase to 71.4%.
- Total growth in PBX shipments will average 7.0% through 1987, down from 7.8% between 1978 and 1982. By 1987, independent manufacturers will see their market share increase to 72.0%.

Divestiture/ Deregulation

The court-ordered divestiture of the Bell System, together with the FCC's deregulation of the telecommunications equipment industry, continues to cause confusion in the marketplace. These two processes overlap and to some extent impact each other, but they are actually two distinct proceedings, initiated separately and following different timetables.

Divestiture

The AT&T divestiture grew out of a federal antitrust case filed by the Department of Justice in 1974. Litigation continued without settlement until January 1982, when the Justice Department and AT&T announced a proposed consent decree as a means of resolving the suit. This proposed decree was modified and approved by a federal judge in August 1982. Some additional modifications were announced in July 1983. The major provisions of the Modified Final Judgement (MFJ), as it now stands, are outlined below:

- Sometime in early 1984, AT&T will divest its wholly-owned Bell Operating Companies (BOCs) but will retain Bell Laboratories, Western Electric Company, and the Long Lines division. Southern New England Telephone and Cincinnati Bell, which are partially owned by AT&T, will not be divested and will be treated as independent telephone companies for most regulatory purposes following divestiture.
- At divestiture, the entire base of the BOCs' in-place customer premises equipment, except that associated with Centrex systems, will be transferred to AT&T. It should be noted that Centrex-related equipment will not be transferred to AT&T at the time of divestiture. The Regional Operating Companies (ROCs) will therefore be left with some equipment to build on. This issue is discussed under the analysis entitled "PBX-Centrex Installed Base." As we go to press, it appears the BOC-embedded base of customer premises equipment will be deregulated by the time of divestiture (see "Deregulation" below).
- The divested BOCs will be regrouped into seven independent ROCs and will be free to provide (lease or sell) new equipment. Though they may not manufacture equipment directly, the ROCs will have the right to sublicense all existing AT&T patents to manufacturers for use in providing the operating companies with equipment. These licensing rights will apply to all patents issued to AT&T for five years after divestiture. All of the divested operating companies are expected to re-enter the business telephone equipment market.
- The "Bell" name and logo have been assigned to the operating companies and AT&T is barred from using "Bell" or the Bell trademark to identify any of its subsidiary companies or their products, except in the case of Bell Laboratories and AT&T's foreign subsidiaries. In August 1983, AT&T announced it would change the name of its American Bell, Inc., subsidiary to AT&T Information Systems.

Deregulation

Deregulation of the telecommunications equipment industry was mandated by the FCC in its May 1980, *Computer II* ruling. Briefly, the *Computer II* ruling deregulated all new equipment offerings as of January 1, 1983, allowing the independent telephone companies to provide (lease or sell) equipment on terms not subject to tariff or government review. Prior to divestiture, the BOCs functionally are barred from offering new equipment, while AT&T must provide equipment through a separate unregulated subsidiary. The FCC has yet to decide whether the divested ROCs will be required to establish separate subsidiaries for the sale or lease of new equipment.

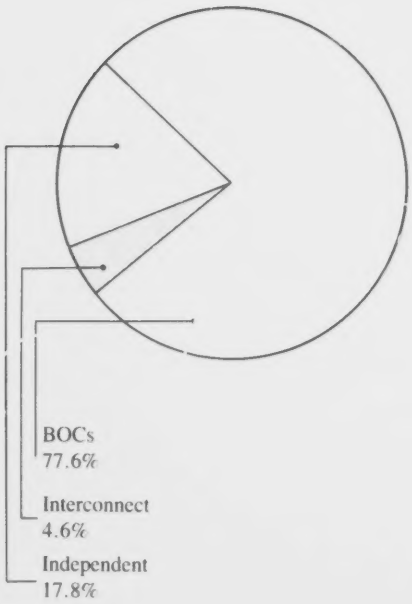
Also of note, the FCC recently gave state regulators the right to require all telephone companies which do not establish separate equipment subsidiaries to provide customers with detariffed single-line instruments, installation, and maintenance through June 30, 1985.

Awaiting FCC action is the question of the embedded base, which remains under regulation. While the commission has given preliminary approval to AT&T's proposed "flash-cut" deregulation of in-place BOC customer premises equipment (CPE) at the time of divestiture, final action is pending. If AT&T's proposal is approved, the embedded base could be transferred directly to AT&T's unregulated subsidiary (AT&T Information Systems). If it is not approved, AT&T would be forced to establish a second subsidiary for the still regulated equipment. AT&T has recently announced sales options for many of its new multi-line business equipment products and probably will offer these same products for sale from the base after deregulation. As for the embedded base of the independent carriers, the commission has indicated it will probably require deregulation over a period ending December 31, 1987.

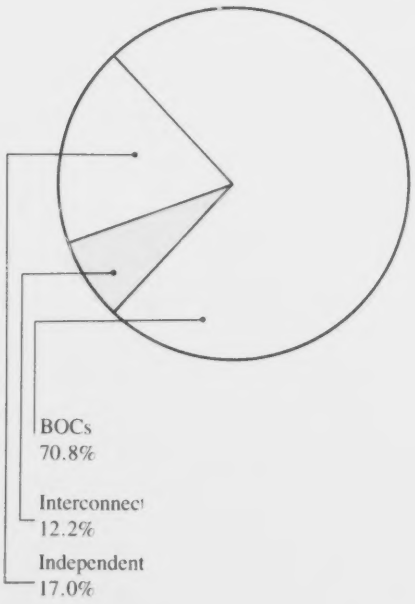
DEVELOPMENT AT A GLANCE

KEY MARKET SHARE: 1978/1982

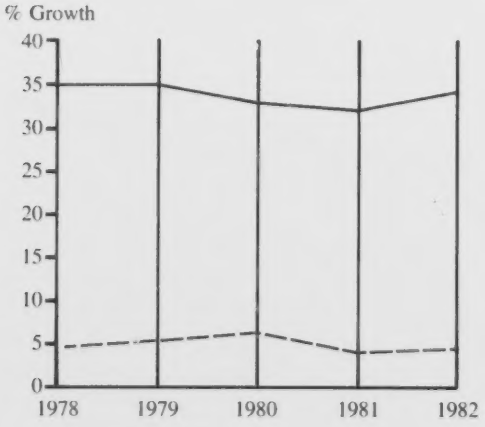
1978



1982



KEY MARKET GROWTH RATE: 1978-1982



Interconnect

Industry Average

Key Installed Base

Divestiture

The projections reflect the recent announcement that AT&T will offer in-place 1A2 key equipment for sale beginning in 1984. In-place 1A2 key equipment that is installed behind PBX or Centrex systems will be offered for sale in the fourth quarter of 1984, with stand-alone equipment to be offered sometime following this, projected for mid-1985. This program is expected to result in a massive shift in the installed base, and will have a number of profound effects on the multiline business equipment market. The sale of in-place equipment to end users will not only create a resale market in Western Electric equipment for the first time, it will also present a tremendous opportunity to interconnect companies in the form of potential service and maintenance contracts.

NATA estimates that there are approximately 19 million 1A2 key instruments in the AT&T installed base, of which half, or 9.5 million, are stand-alone. Assuming AT&T is able to retain or turnover 60 percent of this stand-alone base (either through upgrades or continued maintenance and service on systems already in place), there will be about 3.8 million instruments transferred from the AT&T category to interconnect and the Regional Operating Companies (ROCs). If this process takes two and a half years, from mid-1985 until year-end 1987, there will be 1.5 million instruments transferred annually, with .75 million in the second half of 1985. NATA assumes about two-thirds of these instruments will be picked up by interconnect contractors, with the remaining one-third going to the operating companies. In the table "Key Installed Base Projections," these assumptions are reflected in the sharp decline in AT&T's installed base over the years 1985-87, with a corresponding jump in the interconnect and ROC bases. This jump in the interconnect base reflects the assumption that interconnect contractors will pick up maintenance and service on a substantial number of systems sold to current users. It should not be confused with new sales. It is also assumed this change-out will stimulate some upgrades by customers, resulting in a brief upturn in interconnect key sales in 1985.

Initial reports indicate that AT&T's marketing efforts for key equipment have been less than successful to date, and the majority of competitors interviewed anticipate it will take even longer for the new unregulated subsidiary to develop effective sales in the key market than in PBX. Also, following divestiture, many if not all of the new ROCs will be offering traditional interconnect (non-WECo) equipment on an unregulated basis. Whether these operating companies will offer business equipment directly or through a separate subsidiary has not yet been decided, although the recent federal court decision giving the divested operating companies exclusive use of the Bell name and logo makes it increasingly likely that they will all remain in the business communications equipment market. The growth rate for the independent operating companies has been projected at a slightly lower level than the historical norm. This projected lower growth rate reflects an apparent trend on the part of some independent telcos toward offering business equipment through interconnect subsidiaries rather than through the operating

Key Market: 1978 - 1982

Installed Base Development

Instruments (000)

	1978	1979	1980	1981	1982
BELL OPERATING COMPANIES	11,567	11,961	12,430	12,636	12,773
Growth	3.5%	3.4%	3.9%	1.7%	1.1%
Share	77.6%	76.4%	75.0%	73.2%	70.8%
INDEPENDENT TELEPHONE COMPANIES	2,646	2,765	2,906	2,979	3,053
Growth	4.5%	4.5%	5.1%	2.5%	2.5%
Share	17.8%	17.7%	17.5%	17.3%	17.0%
INTERCONNECT	690	931	1,238	1,635	2,190
Growth	35.0%	35.0%	32.9%	32.1%	33.9%
Share	4.6%	5.9%	7.5%	9.5%	12.2%
TOTAL	14,903	15,657	16,574	17,250	18,016
Growth	4.9%	5.1%	5.9%	4.1%	4.4%

SOURCE: NATA

Installed base refers to the cumulative total of instruments (telephone handsets) in use at the end of each calendar year. The figures for key installed base development and projections reflect stand-alone installations only. "Stand-alone" refers to key systems connected directly to telephone company central offices as opposed to key systems installed behind a PBX or Centrex system.

An historical rule of thumb, probably valid through the 1970s, put the ratio of key instruments at 60 percent stand-alone to 40 percent behind PBX/Centrex. The use of key systems behind PBX and Centrex systems historically has been more common in telco installations than with interconnect. The result: a lower key behind PBX/Centrex ratio for interconnect (estimated at 25 percent) than the industry norm.

Recent market trends indicate an increasing reliance on electronic feature phones (often proprietary), rather than key sets, in new PBX installations. This results in a gradual reduction in key sets behind PBX/Centrex as a percentage of total key systems. The ratio is estimated at about 65 percent stand-alone to 35 percent behind PBX/Centrex for 1983, and is expected to continue to decline as key sets are displaced by hybrid systems, electronic feature phones, and key-inherent PBX.

Key Market: 1983 - 1987
Installed Base Projections

Instruments (000)

	1983	1984	1985	1986	1987
REGIONAL OPERATING COMPANIES	12,674	250	630	1,040	1,238
Growth	−0.8%	*	152.0%	65.1%	19.0%
Share	66.8%	1.2%	3.0%	4.6%	5.2%
INDEPENDENT TELEPHONE COMPANIES	3,160	3,645	3,754	3,867	3,983
Growth	3.5%	15.3%*	3.0%	3.0%	3.0%
Share	16.7%	18.2%	17.7%	17.2%	16.8%
AT&T	250	12,473	11,700	10,893	10,811
Growth	*	*	−6.2%	−6.9%	−0.8%
Share	1.3%	62.3%	55.2%	48.5%	45.7%
INTERCONNECT	2,886	3,670	5,120	6,657	7,651
Growth	31.8%	27.2%	39.5%	30.0%	14.9%
Share	15.2%	18.3%	24.1%	29.6%	32.3%
TOTAL	18,970	20,038	21,204	22,457	23,683
Growth	5.3%	5.6%	5.8%	5.9%	5.5%

SOURCE: NATA

The 22 wholly-owned Bell Operating Companies (BOCs) will be divested by AT&T early in 1984, at which time they will be regrouped into seven independent Regional Operating Companies (ROCs). At the time of divestiture, the BOCs' base of approximately 13 million stand-alone key telephone sets will be transferred to AT&T, as is reflected in the figures for 1984 and beyond. Key systems installed behind Centrex will remain with the ROCs. Two companies historically counted as part of the Bell System, Southern New England Telephone and Cincinnati Bell, will not be divested and will be free to operate as independent telcos, into which category their base has been transferred in the 1984 column.

Interconnect installed base and growth figures have been increased over the 1982 estimates to reflect more comprehensive reports from vendors and manufacturers in 1983. Growth rates are calculated as a percent of the previous year's base. Subtracting the base in a given year from the following year's base will yield the absolute net increase (decrease).

* Growth rates for the Regional Operating Companies and AT&T are not shown for 1984, because of the transfer of the installed base from the operating companies to AT&T. Growth for the Independent Telephone Companies is artificially inflated because of the transfer of Southern New England Telephone and Cincinnati Bell to this category in 1984. Without this adjustment, the growth rate for the independent telcos would have been about 3.2 percent.

company—a trend which has been noted in particular with GTE in Florida and Centel in Texas.

Interconnect Sales

Interconnect sales in the key market have shown strong growth over the past five years and are expected to show continued growth through 1987. Average annual growth in the interconnect installed base was 33.8 percent between 1978 and 1982, while the total installed base grew at an average of about 4.9 percent per year. Interconnect growth is expected to slow to an average annual rate of 28.7 percent between 1983 and 1987, while the total base is expected to grow at an average rate of 5.6 percent. Without the projected sale of embedded AT&T equipment, interconnect growth was estimated at 24.4 percent annually between 1983 and 1987. The decline in interconnect growth reflects a natural pattern of industry development: as the installed base of interconnect equipment grows relative to the total base, interconnect growth rates will approach the industry average. Interconnect's share of the total key phone market increased from 4.6 percent in 1978 to 12.2 percent in 1982 and is expected to reach 32.3 percent in 1987.

NATA predicts a brief surge in interconnect key sales in 1985 due to the expected customer change-out when the embedded AT&T base of 1A2 equipment comes up for sale. The massive shift of equipment from AT&T to customers resulting from this sell-off is expected temporarily to saturate the market with electromechanical equipment and lead to a short-term depression in interconnect sales growth rates in 1986 and 1987. Following their payback periods, the new owners of this 1A2 equipment will be prime candidates for system upgrades. NATA's expectations for sales after 1987 are optimistic. In the meantime, cus-

tomers who purchase in-place 1A2 equipment will present interconnect contractors with a large pool of potential maintenance and service contracts.

Line Sizes

Most vendors report strong sales in all line sizes, including the very small system range (under 12 stations) which represents a relatively new market for most interconnects. Interconnect vendors' expansion into very small key systems, together with the increasing penetration of small PBX into the higher line sizes, is responsible for a gradual decrease in average system size of interconnect key systems. The average new interconnect key system had 13 lines in 1979, down to nine stations by 1982. As the interconnect industry continues its expansion in the very small key market, this average will continue to decline. Stand-alone carrier key systems, both Bell and independent, have an average of five stations per system.

Replacement and 1A2-Type Equipment

Replacement of older interconnect equipment already accounts for a significant percent of total interconnect sales and is expected to grow rapidly as the base ages and turns over. The market for 1A2-type electromechanical key systems continues strong overall, though it accounts for a decreasing share of the total market. While some manufacturers and vendors are discontinuing their electromechanical product lines entirely, others report increased sales in 1982 over 1981. 1A2-type equipment will survive in a low-cost, low-feature niche of the market for small businesses and in key behind-PBX/Centrex applications. Evidence of the continued strength of this market is the current or planned introduction by a number of manufacturers, including TIE and Inter-Tel, of low-feature electronic equivalents to 1A2 equipment, priced competitively with electromechanical products. Several such products are expected to be introduced in late 1983 and early 1984.

Key Shipments

Overview

Average annual growth in key shipments is expected to remain steady through the period 1982-86, though at lower levels than the 1978-82 period. Lower growth rates are expected to result from a tapering off of the effects of AT&T's Migration Strategy, as well as

Key Market: 1978 - 1982
Estimated Shipments

	Instruments (000)				
	1978	1979	1980	1981	1982
WESTERN ELECTRIC COMPANY	1,890	1,732	1,635	1,543	1,453
Share	73.0%	61.9%	54.2%	47.8%	42.7%
INDEPENDENT MANUFACTURERS	700	1,065	1,380	1,686	1,947
Share	27.0%	38.1%	45.8%	52.2%	57.3%
TOTAL	2,590	2,797	3,015	3,229	3,400
Growth	NA	8.0%	7.8%	7.1%	5.3%
DOLLARS (millions)	$493	$556	$598	$643	$691
Growth	NA	12.8%	7.6%	7.5%	7.5%

SOURCE: NATA

The figures show estimates of total shipments at the OEM (Original Equipment Manufacturer) level intended for the U.S. market, including imports. "Independent Manufacturers" refers to all non-WECo key manufacturers, for which interconnect companies and the independent telcos have traditionally offered market outlets.

Through 1982, essentially all of Western Electric's products were marketed through the Bell system, and the BOCs historically installed virtually no non-WECo key equipment (the exception being a small number of electromechanical Key System Units and circuit boards). Beginning in 1984, most if not all of the seven new Regional Operating Companies (ROCs) also will market non-WECo equipment. In contrast to the PBX market, the manufacturing of non-WECo key equipment for the U.S. market has increasingly moved offshore, and the majority of the key equipment presently on the market originates in foreign countries, predominantly in the Far East.

Key Behind PBX/Centrex

It is important to note that the estimated shipments include equipment destined for key behind PBX/Centrex applications as well as for the stand-alone market. It is assumed that in the 1978 to 1982 period, approximately 30 percent of total shipments were installed behind PBX and Centrex systems. This ratio is lower in the interconnect market than is the industry norm. The percentage of total shipments going in behind PBX/Centrex systems is projected to decline, from 30 percent in 1982 to 25 percent in 1987, because of the trend toward the use of proprietary feature phones.

Key Market: 1983 - 1987
Shipment Projections

	Instruments (000)				
	1983	1984	1985	1986	1987
WESTERN ELECTRIC COMPANY	1,230	1,150	1,100	1,150	1,200
Share	34.6%	30.9%	28.4%	28.4%	28.6%
INDEPENDENT MANUFACTURERS	2,330	2,570	2,780	2,900	3,000
Share	65.4%	69.1%	71.6%	71.6%	71.4%
TOTAL	3,560	3,720	3,880	4,050	4,200
Growth	4.7%	4.5%	4.3%	4.4%	3.7%
DOLLARS (millions)	$750	$810	$875	$940	$970
Growth	8.5%	8.0%	8.0%	7.4%	3.2%

SOURCE: NATA

from the projected sell-off of AT&T's embedded base of 1A2 equipment. A temporary downturn is shown in 1987 to reflect the short-term saturation of the market following the embedded base sale. After 1987, replacement of this base of electromechanical equipment should stimulate shipments. NATA expects growth in the five percent range for 1988.

Western Electric Market Share

The most striking trend illustrated by the estimated and projected shipment figures is the steady decline of Western Electric's share of the market. Three developments in the late 1970s and early 1980s changed the shape of the key market in the United States. First, a major competitive obstacle to interconnect vendors was removed through elimination of the Protective Connecting Arrangement (PCA) requirement in favor of the FCC's Registration Program (Part 68). Second, the late 1970s saw interconnect vendors gain a technological advantage over the Bell System with the introduction of Electronic Key Telephone Systems (EKTS) by major independent manufacturers. Last, around 1979-80, AT&T initiated its Installed Base Migration Strategy, which resulted in a massive shift by customers from older, electromechanical equipment to the latest state-of-the-art PBX and key offerings. While the strategy was designed to "migrate" customers within the Western Electric product line, many customers found interconnect a more attractive alternative. The result was a larger loss of market share than AT&T had apparently anticipated. Western Electric's loss of market share is expected to continue into the late 1980's, after which some combination of new products from Western Electric, combined with more effective marketing by AT&T Information Systems, is expected to reverse the trend and allow WECo to recapture some of its lost share. It is important to note that after 1982 AT&T's unregulated subsidiary became Western Electric's primary market outlet, though it is still not clear whether WECo will turn to other vendors as well. The other telco-associated manufacturer, GTE's Automatic Electric division, has almost completely dropped out of the key system market, though reports indicate it will re-enter soon with an electronic 1A2-equivalent product.

The percentage of Western Electric's stand-alone shipments installed as replacement is consistently higher than the industry norm. This rate reflects the weakness of WECo's product line in key equipment and the continued poor marketing performance foreseen for AT&T by most of the competitors interviewed. With shipments driven primarily by relatively vulnerable replacement demand, Western Electric is expected to continue losing market share. As a result, actual performance could easily fall below the levels projected here with a corresponding increase for the independent manufacturers.

Pricing

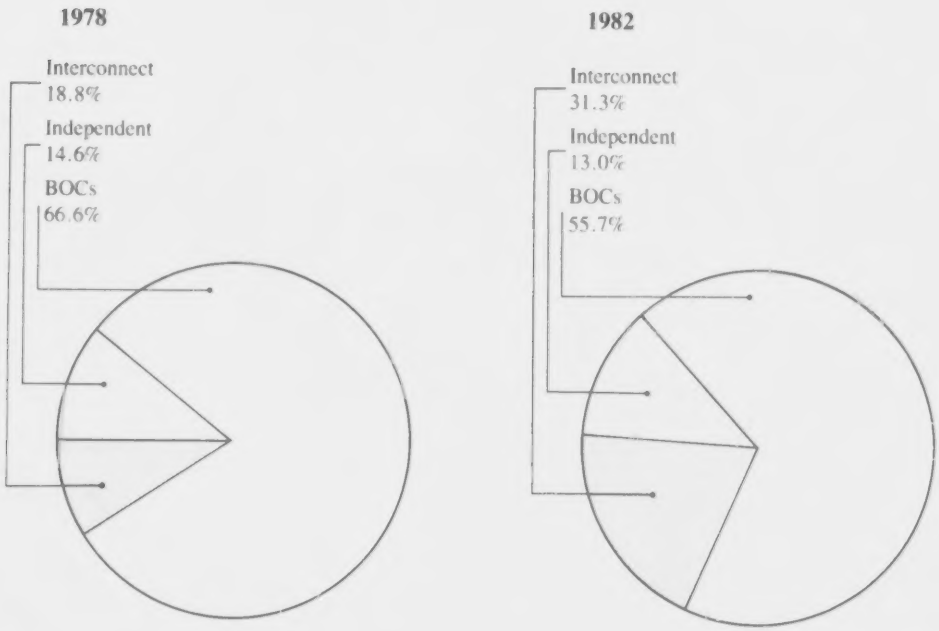
Annual increases in average price per line have been driven by the increasing proportion of more expensive EKTS relative to older and relatively less expensive electromechanical equipment. Increases in the average price per line for the period 1985-1987 may be somewhat less than indicated in the projections, depending on component price movements and the success of new electronic 1A2-equivalents in displacing the electromechanical products.

Replacement Rate

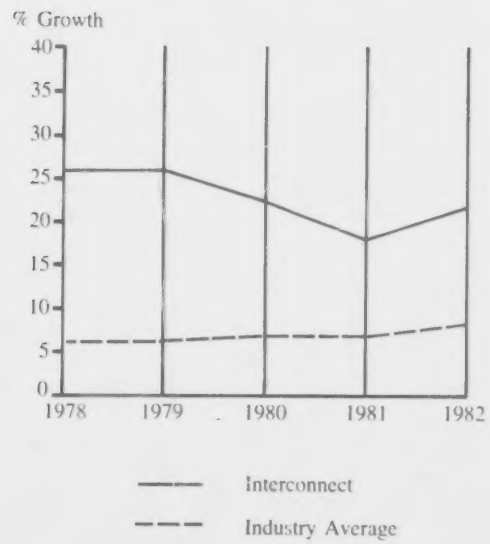
The average rate of replacement of the base was 8.2 percent between 1978 and 1982 and is projected at 6.9 percent from 1983 to 1987. The change over to microprocessor-controlled EKTS will continue to drive the replacement of older equipment, though the sell-off of AT&T's electromechanical base will dampen this effect through about 1986. The replacement rate is expected to rebound sharply around 1987 as this equipment comes up for replacement.

DEVELOPMENT AT A GLANCE

PBX MARKET SHARE: 1978/1982



PBX MARKET GROWTH RATE: 1978-1982



PBX-Centrex Market: 1978 - 1982
Installed Base Development

Instruments (000)

	1978	1979	1980	1981	1982
PBX					
Bell Operating Companies	9,741	9,830	10,106	10,460	10,795
Growth	2.6%	0.9%	2.8%	3.5%	3.2%
Share	66.6%	63.1%	60.6%	58.6%	55.7%
Independent Telephone Companies	2,138	2,307	2,368	2,431	2,510
Growth	4.0%	7.9%	2.6%	2.7%	3.3%
Share	14.6%	14.8%	14.2%	13.6%	13.0%
Interconnect	2,740	3,452	4,211	4,969	6,073
Growth	26.0%	26.0%	22.0%	18.0%	22.2%
Share	18.8%	22.1%	25.2%	27.8%	31.3%
TOTAL PBX	14,619	15,589	16,685	17,860	19,378
Growth	6.5%	6.7%	7.0%	7.0%	8.5%
CENTREX					
Bell Operating Companies	7,348	7,724	7,941	7,890	7,387
Growth	4.7%	5.1%	2.8%	−0.6%	−6.4%
Share	93.6%	93.5%	93.5%	93.7%	93.5%
Independent Telephone Companies	502	541	556	534	514
Growth	6.4%	7.8%	2.8%	−3.9%	−3.8%
Share	6.4%	6.5%	6.5%	6.3%	6.5%
TOTAL CENTREX	7,850	8,265	8,497	8,424	7,901
Growth	4.8%	5.3%	2.8%	−0.9%	−6.2%
TOTAL PBX-CENTREX	22,469	23,854	25,182	26,284	27,279
Growth	5.9%	6.2%	5.6%	4.4%	3.8%
% PBX/CENTREX	65/35	65/35	66/34	68/32	71/29

SOURCE: NATA

Installed base refers to the cumulative total of instruments (telephone handsets) in use at the end of each calendar year.

The projected figures for PBX and Centrex installed base reflect the transfer of assets to AT&T targeted to take place in early 1984 as part of the divestiture process. At that time, the 22 divested Bell Operating Companies (BOCs) will transfer their entire base of in-place PBX equipment to AT&T. The table shows the transferred equipment going to AT&T's unregulated subsidiary, AT&T Information Systems, although it is still possible AT&T will establish a separate subsidiary to handle the transferred base. Following divestiture, the 22 BOCs will be regrouped into seven independent Regional Operating Companies (ROCs) and will begin operations with no installed base of PBX equipment. The divested ROCs will retain their base of Centrex equipment.

PBX-Centrex Market: 1983 - 1987
Installed Base Projections

Instruments (000)

	1983	19[illegible]	1985	1986	1987
PBX					
Regional Operating Companies	10,603	398	611	851	1,125
Growth	−1.8%	*	53.5%	39.3%	32.2%
Share	50.7%	1.7%	2.5%	3.2%	3.9%
Independent Telephone Companies	2,568	2,906	2,960	3,017	3,077
Growth	2.3%	13.2%*	1.9%	1.9%	2.0%
Share	12.3%	12.7%	12.0%	11.3%	10.6%
AT&T	366	10,685	10,831	11,033	11,275
Growth	*	*	1.4%	1.9%	2.2%
Share	1.7%	46.7%	43.7%	41.2%	38.9%
Interconnect	7,386	8,899	10,359	11,850	13,487
Growth	21.6%	20.5%	16.4%	14.4%	13.8%
Share	35.3%	38.9%	41.8%	44.3%	46.6%
TOTAL PBX	20,923	22,888	24,761	26,751	28,964
Growth	8.0%	9.4%	8.2%	8.0%	8.3%
CENTREX					
Regional Operating Companies	6,935	6,325	5,854	5,362	4,874
Growth	−6.1%	−8.8%	−7.4%	−8.4%	−9.1%
Share	93.4%	92.0%	92.5%	92.8%	93.3%
Independent Telephone Companies	491	551	472	414	352
Growth	−4.5%	12.2%*	−14.3%	−12.3%	−14.9%
Share	6.6%	8.0%	7.5%	7.2%	6.7%
TOTAL CENTREX	7,426	6,876	6,326	5,776	5,226
Growth	−6.0%	−7.4%	−8.0%	−8.7%	−9.5%
TOTAL PBX-CENTREX	28,349	29,764	31,087	32,527	34,190
Growth	3.9%	5.0%	4.4%	4.6%	5.1%
% PBX/CENTREX	74/26	77/23	80/20	82/18	85/15

SOURCE: NATA

Two companies historically considered Bell Operating Companies, Southern New England Telephone and Cincinnati Bell, will not be divested and will be free to operate as independent telcos. As a result, their base of both PBX and Centrex equipment has been shifted to the independent telco category in 1984 and beyond.

Growth rates are calculated as a percent of the previous year's base. Subtracting the base in a given year from the following year's base will show the absolute net increase (decrease).

* PBX growth rates for the Regional Operating Companies and AT&T are not shown in 1984 because of the transfer of the installed base from the operating companies to AT&T. Growth rates for the Independent Telephone Companies are artificially inflated due to the transfer of Southern New England Telephone and Cincinnati Bell to this category in 1984.

PBX-Centrex Installed Base

The Future of Centrex

Combined PBX-Centrex growth averaged five percent annually between 1978 and 1982 and is projected to average 4.5 percent from 1983 to 1987. This fairly strong overall growth masks a sharp decline in the Centrex installed base in the early 1980s. Centrex enjoyed a very high rate of average annual growth from its introduction in 1961 through the mid-1970s, during which period Bell successfully marketed it against electromechanical PABX equipment. Beginning in the mid-1970s, however, Centrex ran into heavy price and feature competition from stored program controlled PBX products, and Bell shifted its emphasis to Dimension, which it introduced in 1975-76. Centrex was able to hold its own, maintaining a steady, low rate of growth until 1980, when it took a sharp dip followed by an actual decline in the installed base in 1981 and 1982. Both Bell System and independent Centrex suffered prior to 1983 from a lack of enhancements, high cost relative to modern PBX products, and an apparent decision by AT&T to abandon it.

As a result of the AT&T divestiture, the fate of Centrex has become a critical issue for the BOCs, which will lose their base of PBX equipment but retain Centrex. Both Bell System companies and the independent telcos have launched an aggressive campaign to revive Centrex, offering "price stabilization" plans, comprehensive feature enhancement packages, and lower line-size configurations. But, the recent FCC decision imposing access charges directly on Centrex CO lines will dramatically limit the future of Centrex as a viable product. Centrex CO users access the network on an individual basis, one line per instrument, as opposed to PBX users whose access is bundled onto trunks, with an average of several instruments per trunk. The decision to impose the regular business access charge (which will rise annually from an initial $6 per line per month in 1984) on each Centrex line will make new Centrex installations comparatively more expensive than comparably-sized PBX systems. Centrex systems which were in-place or on order as of July 27, 1983, will be assessed at the regular residential rate of $2 per line per month in 1984. This smaller charge will make it easier for operating telcos to offset the user's added monthly expense through rate reductions, but even this is expected only to slow the change-out from Centrex to PBX.

With the imposition of the access charge decision, the critical consideration for the future of in-place Centrex systems becomes the ability to offer sophisticated voice and data features, including tandem switching, route optimization, integrated data transmission, automatic call distribution, voice store and forward applications, and call management systems. Telephone operating companies and manufacturers (including Western Electric) have initiated a program to update Centrex along these lines, but there seems to be a basic conflict in allowing telcos to offer some of these features through Centrex. Not only do they resemble the FCC's definition of "enhanced service" under the *Computer II* ruling, but many of these proposed enhancements appear to violate the Modified Final Judgement's prohibition on the BOCs' providing "information services" as well. Initial proceedings before the FCC indicate that the issue may be decided piecemeal, on a feature-by-feature basis, leaving Centrex's ability to compete clouded for years to come. The telcos' inability to guarantee such features, or their inability to offer some of them at all, is expected to compel large, sophisticated users to move away from Centrex to enhanced PBX products.

As is shown on the chart "PBX-Centrex Market: 1983-1987," the access charge decision is expected to accelerate the decline in the Centrex base. Even with expected rate reductions and possible feature enhancements for existing customers, no more than 5,500,000 Centrex instruments are expected to be in use by year-end 1987.

Continued PBX Growth

The PBX market grew at an average annual rate of seven percent from 1978 through 1982, with projected growth at 8.4 percent through 1987. This high rate of projected growth results largely from the expected customer change-out from Centrex to PBX systems as a result of the FCC's recent access charge decision. The interconnect base of PBX equipment averaged 22.8 percent growth from 1978 through 1982 and is expected to average 17.3 percent through 1987. These projections are up from the 17 percent annual growth projected prior to the FCC's decision.

As with the key market, growth rates for interconnect companies will approach the industry average as the interconnect base of installed equipment grows relative to the entire base. Growth rates for the independent telcos have been projected at lower than historical norms to reflect an apparent trend among the larger independents toward emphasizing sales through their interconnect subsidiaries at the expense of the operating companies.

A number of interrelated factors continue to shape the development of the PBX market. Since the mid-1970s, the introduction of computerized, stored program control switching systems has stimulated growth of the base and generated a relatively high replacement rate for older electromechanical equipment. This trend has been artificially stimulated since Bell's Migration Strategy was begun in the late 1970s and is expected to reach a peak in 1984. The growing replacement of Centrex service has greatly expanded sales of very large systems (500 lines and up) since about 1980, with interconnect penetration of this market reaching significant proportions for the first time. The combined effects of technology change-out, AT&T's Migration Strategy, and Centrex replacement are expected to decline after 1985. A return to more normal growth rates is projected for 1986 and 1987, although the eight percent growth forecast for 1986-87 is still higher than the 7.5 percent forecast prior to the FCC announcement. A new cycle of technology change-out is expected to begin around 1985, involving upgrades to third generation integrated voice and data products. This trend is expected to accelerate around 1987.

Integrated Voice and Data

Integrated voice and data capabilities are still not significant factors in most PBX sales, largely because the data requirements of most users are small in vol-

ume and still primarily low-speed in nature. Integrated voice and data products will become significant in the mid to late 1980s. The appearance of switches designed for Local Area Network (LAN) applications indicates that PBXs will survive and probably benefit from this emerging technology. The 1980s will be characterized by a "systems" market, involving multiple PBX locations and integrated voice and data applications. The average PBX will continue to grow in size because of trends in office consolidation, the increasing attachment of data terminals to switches, and the tendency by large users to connect PBXs at multiple locations through tie lines. The small end of the market is increasingly dominated by hybrid systems, which combine PBX features with the ease of use of key systems.

Capital Spending Cycles

Complementing the technology-driven evolution of the market is a growing shift in user perceptions of PBX equipment. Rather than viewing switching service as a utility cost, companies are increasingly treating PBX acquisitions as a capital expense, with the equipment seen as a cost-saving, productivity-linked tool. The current high replacement rate for crossbar and older equipment is tied to enhanced feature availability; the reduced energy, maintenance, and space requirements of solid-state equipment; and declining payback periods. The long-term implication of this development is likely to be an increased link between the growth of PBX sales and general economic conditions, as future decisions to purchase switching systems become part of the regular pattern of capital expenditures. This means that the high, sustained growth rates of the 1970s and 1980s are unlikely to be repeated in the 1990s.

Interconnect Sales

While the interconnect market as a whole has rebounded from the 1981-early 1982 slump, performance of individual vendors has been mixed. Some are still reporting sluggish sales, while others saw a decided upturn the second half of 1982 and many report an even stronger first half of calendar 1983. In general, interconnect strength has been concentrated among large, well-capitalized vendors which are able to offer customers attractive financing terms and to survive the fierce price competition still dominating the PBX market. Severe price competition has been a factor in the market for some time, but is showing signs of easing, especially in the large system market where service, reliability, and features are often the deciding influences on purchase decisions. The concentration of interconnect sales among companies with large regional or national sales outlets will continue for the next several years, primarily through the continued acquisition of medium-sized companies by larger firms. This continued pattern of concentration at the vendor level should lead to an eventu-

PBX Market: 1978 - 1982
Estimated Shipments

	Instruments (000)				
	1978	1979	1980	1981	1982
WESTERN ELECTRIC COMPANY	1,110	1,240	1,200	1,160	1,200
Share	48.6%	50.0%	45.1%	40.5%	39.0%
INDEPENDENT MANUFACTURERS	1,170	1,242	1,460	1,705	1,880
Share	51.4%	50.0%	54.9%	59.5%	61.0%
TOTAL	2,280	2,482	2,660	2,865	3,080
Growth	NA	8.9%	7.2%	7.7%	7.5%
DOLLARS (millions)	$560	$617	$672	$735	$801
Growth	NA	10.2%	8.9%	9.4%	8.9%

SOURCE: NATA

The figures show estimates of total shipments at the OEM (Original Equipment Manufacturer) level intended for the U.S. market, including imports. Unlike the key market, imports account for a very small percentage of total PBX shipments, although a number of foreign firms maintain manufacturing plants in the United States.

Beginning in 1983, Western Electric Company shifted its primary market outlets from the Bell Operating Companies to AT&T's new unregulated subsidiary (recently renamed AT&T Information Systems). Following their divestiture, the seven newly-formed Regional Operating Companies will begin marketing non-WECo equipment and are expected to become major outlets for competitive manufacturers.

With the loss of the Bell Operating Company market, Western Electric's shipments are expected to decline below historical levels through the mid-1980s, reflecting the low growth rate projected for AT&T. Shipments through 1986 will serve largely as replacement equipment for change-outs in the AT&T base. This situation is expected to reverse around 1987 with increasing Western Electric shipments reflecting AT&T's renewed marketing strength and its recapture of some lost market share.

al easing of pressure on prices as sales regions are stabilized and vendors move to recoup the losses sustained during the period of growth.

AT&T

The period of uncertainty and of "user hesitation" sparked by the entrance of American Bell (recently renamed AT&T Information Systems) into the market seems to have passed, with interconnect vendors reporting an upturn of bid requests, especially from large users. Despite AT&T's initial problems with prices and products, the company is expected to develop into a strong competitor in the PBX market, though not before late 1984. AT&T will concentrate its marketing efforts on very large users, stressing its reputation for service, "office automation," and a "systems" approach to evolving communications needs.

PBX Market: 1983-1987
Shipment Projections

	Instruments (000)				
	1983	1984	1985	1986	1987
WESTERN ELECTRIC COMPANY	1,100	1,000	1,000	1,050	1,200
Share	33.7%	27.8%	24.2%	26.2%	28.0%
INDEPENDENT MANUFACTURERS	2,165	2,600	3,139	2,960	3,085
Share	66.3%	72.2%	75.8%	73.8%	72.0%
TOTAL	3,265	3,600	4,139	4,010	4,285
Growth	6.0%	10.3%	14.9%	−3.1%	6.9%
DOLLARS (millions)	$850	$940	$1,090	$1,080	$1,175
Growth	6.1%	10.6%	15.9%	−1.0%	8.8%

SOURCE: NATA

PBX SHIPMENTS

Western Electric Market Share

Annual growth in PBX shipments averaged 7.8 percent between 1979 and 1982 and is projected to average 7.0 percent from 1983 through 1987. Western Electric's share of total shipments has declined much more rapidly than was expected a few years ago, although it will level out through the projected period and regain some lost share before 1990. AT&T's market loss has been much more pronounced in the small and mid-size markets than in large systems. WECo is still the largest single manufacturer of PBX equipment in the U.S. and is expected to remain so for the foreseeable future.

Increases in average price per line for PBX will be driven by the increasing share of sophisticated digital and integrated voice and data products, even though the average price per line for these systems should drop as production volumes pick up.

An increasingly competitive market is foreseen following divestiture with emphasis on vendor service and reliability, support for peripheral and data equipment, and increased product overlap among manufacturers. Vendor concentration will be offset by continued strength of small, local outlets. The departure of some manufacturers from the market (Datapoint, Rockwell) will be more or less matched by the entrance of new competitors (Ztel, CXC), with the result that the manufacturer's market will "churn" rather than see an absolute shake-out.

Centrex Replacement

The recent FCC decision to apply regular business access charges directly to all new Centrex CO lines and residential charges to embedded Centrex CO is expected virtually to eliminate Centrex as a viable market option. The change-out by customers moving from Centrex to PBX systems is reflected in the "PBX-Centrex Installed Base Projections" chart. This change-out will stimulate PBX shipments, especially in 1984-85, as is shown in the "PBX Shipment Projections" chart. The seven percent average annual growth projected for PBX shipments between 1983 and 1987 is up from the 5.2 percent average annual growth which was projected prior to the FCC's announcement. This stimulus will be short-lived, however, and normal growth patterns for the industry will reappear by 1987.

Integrated Voice and Data

Another cycle of technology-oriented product turnout is developing, centered on "third generation" switches incorporating design-inherent simultaneous voice and data capabilities and in some cases LAN-associated characteristics. This trend will become significant around 1985, though it is not expected to proceed nearly as quickly as the previous change-out. The current generation of products is expected to see a service life of at least seven to 10 years, which could be extended by the widespread application of add-on enhancements providing integrated voice and data capabilities and by a new generation of sophisticated "workstation" terminals. Since most businesses are

still not heavy data users, data requirements probably will grow at a fairly even pace, which initially will be met easily by add-on capabilities. In addition, the next generation of switching equipment is proving costly and difficult to develop and field. Users may well be inclined to put off upgrading to a fully-integrated system until their data needs demand it and the new products have proven themselves. True design-inherent third generation products will not achieve large volume shipments until 1987 and will continue to be priced at a premium for some time to come.

Replacement Rate and Migration

The annual rate of replacement for the installed base averaged 10 percent between 1978 and 1982, driven largely by the change-out from electromechanical and hard-wired logic electronic systems to products featuring software-driven, stored program control. This change-out has been artificially stimulated by AT&T's Installed Base Migration Strategy (IBMS) which forced the pace of normal product turnover by drastically raising the lease charges on older Western Electric equipment, thus encouraging customers to "migrate" to Bell's newer "flagship" products, primarily Horizon key and Dimension PBX. The timing and coherence of this program were disrupted somewhat by the reluctance of some state regulatory bodies to grant the requested rate hikes, and it seems clear that the BOCs lost considerably more customers to interconnect than AT&T had anticipated. The strategy was a success to the extent that the majority of the targeted customers did migrate within the Western Electric product line, usually signing long-term lease agreements with the BOCs, and the base of installed PBX has turned over very rapidly with an estimated 50 percent replaced between 1978 and 1982.

This success is reflected in the lower average annual rate of replacement projected for the period 1982 through 1987, as customers vulnerable to migration make replacement decisions quickly. When the process is completed by the end of 1984, an estimated 65 percent of the base will have turned over.

PBX Estimated Installed Base By Line Size: 1981 & 1986

LINE SIZE	TOTAL LINES (000)	% OF TOTAL LINES	AVERAGE LINE SIZE	TOTAL SYSTEMS (000)	% OF TOTAL SYSTEMS
			1981		
UNDER 100	6,430	36.0%	40	161	76.0%
100-400	7,144	40.0%	165	43	20.0%
OVER 400	4,286	24.0%	500	8.5	4.0%
TOTAL	**17,860**	**100.0%**	**84**	**212.5**	**100.0%**
CENTREX	8,424	*	550	15.3	*
COMBINED TOTAL	26,284	*	115	227.8	*
			1986		
UNDER 100	8,988	33.6%	43	209	77.4%
100-400	6,848	25.6%	160	43	15.9%
OVER 400	10,915	40.8%	600	18	6.7%
TOTAL	**26,751**	**100.0%**	**99**	**270**	**100.0%**
CENTREX	5,776	*	460	12.5	*
COMBINED TOTAL	32,527	*	115	282.5	*

SOURCE: NATA

These figures present NATA's best estimates of the composition of the PBX installed base. The projections for 1986 reflect the expectation that the greatest growth in the next several years will be in very small systems (under 100 lines), and very large systems (over 400 lines), while the mid-range remains fairly stable. Average PBX system size will increase slightly, while Centrex will shrink dramatically, because of the projected loss of very large installations and the relative success of small systems.

*Not applicable.

BELL PBX-Centrex Instrument Movement by State: 1982

	JANUARY 1	INWARD	OUTWARD	DECEMBER 31	% CHANGE
ALABAMA	225,626	38,336	40,662	223,300	−1.0
ARIZONA	235,855	52,939	50,516	238,278	1.0
ARKANSAS	88,800	14,165	20,240	82,725	−6.8
CALIFORNIA	2,153,684	355,949	409,348	2,100,285	−2.5
COLORADO	327,697	79,188	66,414	340,471	3.9
CONNECTICUT	353,319	53,983	54,407	352,895	−0.1
DELAWARE	81,679	11,875	10,242	83,312	2.0
D.C.	480,820	77,761	75,331	483,250	0.5
FLORIDA	573,942	102,200	93,338	582,804	1.5
GEORGIA	425,069	73,376	67,303	431,142	1.4
IDAHO	58,793	9,808	12,286	56,315	−4.2
ILLINOIS	1,102,140	176,151	193,763	1,084,528	−1.6
INDIANA	298,067	32,606	45,714	284,959	−4.4
IOWA	188,980	31,859	41,401	179,438	−5.0
KANSAS	161,219	28,578	30,452	159,345	−1.2
KENTUCKY	144,148	23,235	30,520	136,863	−5.1
LOUISIANA	292,697	55,897	48,051	300,543	2.7
MAINE	63,193	9,090	8,846	63,437	0.4
MARYLAND	473,457	81,905	64,578	490,784	3.7
MASSACHUSETTS	627,942	121,678	126,106	623,514	−0.7
MICHIGAN	745,431	113,830	117,071	742,190	−0.4
MINNESOTA	384,980	61,004	66,174	379,810	−1.3
MISSISSIPPI	140,287	36,037	31,849	144,475	3.0
MISSOURI	377,723	72,245	76,472	373,496	−1.1
MONTANA	52,606	7,128	8,508	51,226	−2.6
NEBRASKA	87,741	11,048	11,653	87,136	−0.7
NEVADA	46,810	5,733	7,824	44,719	−4.5
NEW HAMPSHIRE	68,638	12,222	12,034	68,826	0.3
NEW JERSEY	810,233	145,186	130,783	824,636	1.8
NEW MEXICO	95,338	17,577	22,913	90,002	−5.6
NEW YORK	1,631,148	235,499	299,999	1,566,648	−4.0
NORTH CAROLINA	270,479	47,371	43,813	274,037	1.3
NORTH DAKOTA	49,573	10,904	9,544	50,933	2.7
OHIO	676,461	120,744	148,513	648,692	−4.1
OKLAHOMA	229,393	52,557	42,848	239,102	4.2
OREGON	208,793	25,095	42,816	191,072	−8.5
PENNSYLVANIA	956,335	131,837	140,505	947,667	−0.9
RHODE ISLAND	79,737	13,202	21,274	71,665	−10.1
SOUTH CAROLINA	187,635	28,133	30,057	185,711	1.0
SOUTH DAKOTA	43,195	9,144	10,052	42,287	−2.1
TENNESSEE	279,491	48,641	61,166	266,966	−4.5
TEXAS	1,104,171	300,472	252,933	1,151,710	4.3
UTAH	103,883	20,678	23,876	100,685	−3.1
VERMONT	31,171	5,713	4,952	31,932	2.4
VIRGINIA	460,198	94,320	68,497	486,021	5.6
WASHINGTON	362,695	76,333	89,804	349,224	−3.7
WEST VIRGINIA	108,291	16,835	17,482	107,644	−0.6
WISCONSIN	329,104	56,152	69,321	315,935	−4.0
WYOMING	46,219	10,785	7,554	49,450	7.0
TOTAL	18,324,886	3,217,004	3,359,805	18,182,085	−0.8

SOURCE: FCC (Figures include Centrex.)

Bell PBX Movement

"January 1" indicates the accumulated installed base of PBX-Centrex instruments for the Bell Operating Companies at the beginning of 1982. "Inward" refers to all PBX-Centrex instruments installed by the BOCs during the year, whether as additions to existing systems, replacements of older equipment with new equipment, or as completely new installations. "Outward" refers to all PBX-Centrex instruments removed by Bell during the year. "December 31" shows the net installed base at the end of the year.

This table provides a graphic example of why looking at the net change in installed base development provides a poor indication of actual market activity in a given year. In 1982 the Bell System saw an actual decline in its installed base of PBX-Centrex instruments, from 18,324,886 at year-end 1981 to 18,182,085 at year-end 1982. This decline was equivalent to 0.8 percent of the 1981 installed base. On its own, this decline would seem to indicate a disastrous year for Bell System sales. The column showing "inward" movement, however, indicates that the Bell companies installed over three million new instruments in 1982, even though the net installed base declined. New instruments installed represented 17.6 percent of the 1981 installed base. Since the net installed base declined, the majority of these new instruments must have been replacements and upgrades to existing systems in the Bell base. Similarly, it can be concluded that the greatest part of the Bell and independent telcos' equipment activity every year is replacement and upgrading of existing systems, with no effect on the net installed base. This activity, commonly called "churn" by telco personnel, must be taken into account when an analyst attempts to estimate total annual activity from the net change in installed base.

Geographical Penetration of the PBX Market Bell vs. Interconnect 1983

CITY	BELL	INTER-CONNECT
Atlanta	87%	13%
Detroit	86	14
Philadelphia	82	18
San Francisco	80	20
Miami	80	20
Washington, D.C.	79	21
Minneapolis	78	22
Seattle	77	23
Dallas	74	26
New York	71	29
Houston	69	31
St. Louis	68	32
Chicago	65	35
Denver	59	41
Los Angeles	58	42
Boston	57	43

SOURCE: Eastern Management Group

PBX Distribution by City: 1982

	(System grouped by line size)				
	UNDER 100	100-249	250-499	500-999	1,000 AND OVER
Atlanta	1,057	583	198	42	35
Atlantic City	462	203	50	22	8
Baltimore	885	403	141	49	29
Birmingham	390	238	53	16	13
Boston	1,940	1,138	274	148	79
Charlotte	363	226	87	21	11
Chicago	3,661	2,154	602	295	164
Cincinnati	689	376	105	43	32
Cleveland	1,082	581	166	74	42
Columbus	490	279	92	43	23
Dallas	1,624	917	256	104	44
Denver	952	549	118	40	30
Detroit	1,992	926	226	104	95
Hartford	536	261	63	42	26
Houston	1,670	871	252	112	68
Indianapolis	589	293	83	24	22
Jacksonville	319	225	50	25	5
Kansas City	690	400	114	44	29
Las Vegas	162	113	20	17	16
Los Angeles	4,425	2,173	609	228	137
Louisville	413	252	76	25	24
Memphis	417	228	76	22	15
Miami	872	440	116	37	23
Milwaukee	819	362	142	45	49
Minneapolis	1,348	756	217	69	54
New Orleans	557	357	88	41	21
New York	4,015	2,270	621	291	205
Omaha	305	158	32	19	7
Philadelphia	1,907	1,147	309	184	74
Phoenix	760	331	92	33	19
Pittsburgh	868	464	142	70	63
Portland	713	325	86	45	19
Sacramento	361	191	32	7	5
St. Louis	1,241	600	215	71	49
Salt Lake City	464	186	52	17	16
San Antonio	440	226	48	25	14
San Diego	702	346	63	32	18
San Francisco	1,648	815	220	80	63
San Jose	634	357	91	46	25
Santa Ana	946	532	156	57	28
Seattle	967	378	91	36	22
Tampa	641	315	91	29	13
Tulsa	338	172	51	21	7
Washington, D.C.	1,349	695	205	70	37
TOTAL	46,920	24,928	6,889	2,876	1,779*

TOTAL SYSTEMS 83,392

SOURCE: Eastern Management Group

Interconnect Sales and Revenues

Volume

Annual growth of interconnect sales volume, as measured by new instruments installed, averages 17.7 percent for the period shown. While overall growth is expected to remain strong, it will also continue to be spotty with large, financially strong companies and successfully specialized vendors showing the best results.

Mainstream interconnect products, both PBX and key, can be divided into two general categories. One is composed of standard, easily installed and maintained, cost-effective systems. These products are generally distributed through a wide variety of vendors with very little manufacturer participation. The other category consists of more sophisticated, highly featured products, increasingly marketed directly by manufacturers or through exclusive dealers with strong manufacturer support. Both types of products fill important market niches, and the distribution patterns probably will become increasingly diverse with primary market areas (the top 200 metropolitan areas) supporting a range of principal vendors specialized by product.

Successful vendor strategies in the 1980s will include: the introduction of new products, especially sophisticated terminals and work stations aimed at the evolving automated office; an increasing reliance on service revenues and secondary sales of peripheral products to an existing customer base; and an expansion of line-size offerings, especially toward larger systems, for primary PBX and key products.

New Sales

Interconnect contractor sales will be impacted by two developments during the projected period: accelerated Centrex replacement and the sale of the embedded AT&T 1A2 key equipment. Replacement of Centrex CO systems will stimulate PBX sales at least through 1985, by which time the majority of customers will have upgraded and replacements will begin to drop off. Growth rates in PBX sales will be lower in 1985 and 1986 but should begin to pick up again around 1987 as the change-out to third generation voice and data switches accelerates.

Key sales growth will continue fairly strong through 1984, with a brief surge projected for 1985 reflecting the assumption that many customers, faced with a purchase option on their in-place AT&T equipment, will decide to upgrade and go with interconnect. Key sales in 1986 and 1987 are expected to show considerably lower growth, as much of the market will be saturated with Western Electic 1A2 key sets. Key sales should begin to pick up again following 1987 as customers begin to upgrade their purchased Western Electric equipment.

Prices

The interconnect market continues to be characterized by a saturation of vendors and pervasive price competition. Larger companies, especially those closely associated with specific manufacturers or with large regional or national sales networks, seem to be sacrificing short-term profits in an attempt to secure a large base of customers.

As a result, prices have been artificially depressed. While installed prices for equipment vary widely between products and line size groupings, the industry average has dropped from about $1,000 per installed line of PBX in 1980 to about $825 in 1983. Key system prices are down from about $950 per installed line in 1980 to about $850 in 1983.

Prices tended to remain fairly flat through the 1970s with upward pressure from product upgrades and inflation offset by technology-related cost reductions and vendor acceptance of low-margins. The current extreme price-depression is considered abnormal and is not expected to last past 1984-85. The ongoing vendor strategy of establishing a large customer base on which to build later service and secondary product sales has been accompanied by a fast pace of vendor consolidation, which has occurred principally through acquisition. In the primary markets, the consolidation of a small number of dominant vendors, differentiated by product, is expected to ease the pressure on prices. At the same time, recent developments indicate that the next generation of products, in the PBX market especially, will be able to sustain a price premium for some time to come. The combined effect of these trends should result in a gradual upward movement in average price per line through the projected period.

Other Revenues

Other revenues are generated by service offerings (primarily moves, changes, and maintenance), expansion of existing systems, and secondary sales of peripheral and data products to established customers. At an average annual rate of 25.2 percent, this is the fastest growing component of interconnect revenues. Revenues derived from service offerings are expected to be substantially enhanced when AT&T begins selling in-place 1A2 key equipment to users, probably around mid-1985. NATA projects interconnect contractors will pick up maintenance and service for over two million Western Electric 1A2 key sets by year-end 1987.

The high growth projected for this category highlights the importance of establishing a large base, especially of medium and large users, as a foundation for automated office product sales and service revenues. The expectation of higher margins on follow-up sales and service provides the rationale for many companies accepting low-margins on initial sales.

The projected growth in these revenues also reflects a growing trend toward interconnect becoming a service industry. The near saturation of the PBX market in the 100-400 line range, the tapering off of the artificially stimulated demand caused by AT&T's Migration Strategy, and the increasing tendency for new sales to be tied to capital spending cycles all mean that vendors will be unable to rely on the sustained, high growth rates of the 1970s. Revenues from secondary sales and service will represent a steadily increasing share of total revenues, growing from 22 percent in 1982 to a projected 27 percent by 1987. Companies with exceptionally large customer bases or with a base dominated by very large users will derive even larger shares of total revenue from this category. In addition, margins derived from service pricing should improve as the Bell telephone companies, with subsidized service offerings, lose their base and as the independent telcos account for a decreasing share of the total market.

Interconnect Industry Projected Sales and Other Revenues: 1982 - 1987

	NUMBER INSTRUMENTS (000)	NEW SALES ($ million)	OTHER REVENUES ($ million)	TOTAL REVENUES ($ million)	OTHER REVENUES AS % OF TOTAL
1982					
PBX	1,255	$1,098			
KEY	600	534			
TOTAL	1,855	$1,632	$ 425	$2,057	20.7%
1983					
PBX	1,676	$1,385			
KEY	760	646			
TOTAL	2,436	$2,031	$ 525	$2,556	20.5%
Growth		24.4%	23.5%	24.3%	
1984					
PBX	2,000	$1,700			
KEY	857	737			
TOTAL	2,857	$2,437	$ 660	$3,097	21.3%
Growth		20.0%	25.7%	21.2%	
1985					
PBX	2,220	$1,950			
KEY	1,154	1,035			
TOTAL	3,374	$2,985	$ 835	$3,820	21.9%
Growth		22.5%	26.5%	23.3%	
1986					
PBX	2,490	$2,215			
KEY	1,254	1,140			
TOTAL	3,744	$3,355	$1,060	$4,415	24.0%
Growth		12.4%	26.9%	15.6%	
1987					
PBX	2,830	$2,525			
KEY	1,325	1,200			
TOTAL	4,155	$3,725	$1,310	$5,035	26.0%
Growth		11.0%	23.6%	14.0%	

SOURCE: NATA

These figures show annual sales and service revenues for interconnect vendors at the end-user level. They are not cumulative. Figures for key systems and instruments refer to stand-alone installations only. "Other" revenues are generated by service offerings and secondary sales to established customers. Dollar figures are in current dollars.

Residential Market

The market for residential telephone equipment is younger, more turbulent, and harder to track than the business market. Although the FCC formally opened the residential market to non-telco competitors in 1977, residential customers have been much slower than their business counterparts in taking advantage of the competitive offerings available to them. Because of an initial lack of awareness among customers of the options available to them, demand for home telephone sets did not "take off" significantly until 1982. While there is considerable controversy about the size and composition of the current market, NATA estimates total retail sales for 1982 at $473 million on 4.6 million units, including standard desk sets, decorator, electronic feature, and cordless telephones.

Estimated 1982 Retail Telephone Sales

Type	Units (000)	Average Price Per Unit	Revenues ($M)
Standard	1,350	$ 32.50	$ 43.9
Decorator	1,500	100.00	150
Electronic	750	145.00	108.8
Cordless	1,000	170.00	170
TOTAL	4,600		$472.7

In addition to the retail sales outlined above, approximately two million sets are estimated to have been sold out of the Bell System's installed base in 1982. In a March 1983 filing in FCC Docket 81-893, AT&T indicated that the maximum purchase price for in-place single-line telephone sets would be:

	Rotary	Touchtone
Standard	$19.95	$41.95
Princess	$39.95	$49.95
Trimline	$44.95	$54.95

In the same filing, AT&T also indicated that rotary phones constituted 42 percent of all in-place single-line sets.

Recent press articles have reported AT&T estimates for the national residential market at 85 million households with small businesses (one to two lines) at seven million additional locations. AT&T also estimated that approximately 30 million single-line instruments will be sold and leased in 1983 (including those available from regulated telcos). Revenues from the 10 million units to be sold is projected at $1 billion. Numerous sources indicate the fastest growing category of phones sold is the cordless variety.

Carrier Telephone Instruments
Installed Base Development: 1970-82
(000)

YEAR	BUSINESS		RESIDENTIAL		TOTAL	
	Instruments	Growth	Instruments	Growth	Instruments	Growth
1970	33,305	3.4%	86,916	4.7%	120,221	4.4%
1971	34,445	3.4%	90,696	4.3%	125,441	4.1%
1972	35,990	4.5%	95,613	5.4%	131,603	5.2%
1973	37,435	4.0%	100,853	5.5%	138,288	5.1%
1974	38,749	3.5%	105,222	4.3%	143,971	4.1%
1975	39,498	1.9%	109,510	4.1%	149,008	3.5%
1976	40,682	3.0%	114,491	4.5%	155,173	4.1%
1977	42,320	4.0%	119,752	4.6%	162,072	4.4%
1978	44,284	4.6%	124,743	4.2%	169,027	4.3%
1979	45,952	3.8%	129,583	3.9%	169,027	4.3%
1980	47,214	2.7%	133,210	2.8%	180,424	2.8%
1981	47,780	1.2%	134,112	0.7%	181,892	0.8%
1982	47,396*	−0.8%	127,486*	−4.9%	174,882*	−3.9%

*Note: Figures for 1982 are estimated; totals for independent carrier instruments are not available.

Installed base refers to the cumulative total of instruments (telephone handsets) provided under tariff by the regulated telephone operating companies and in use at the end of the calendar year.

1982 marked the first year that the carrier telephone instrument market experienced a net loss in growth. Some possible explanations for this loss include: the near saturation (96%) of the instrument market; the recent economic downturn; the divestiture of the AT&T operating companies, which has led to purchases from the Bell installed base; and continued growth of customer-owned instruments.

SOURCE: FCC

Subscriber Access Lines

Access Charges

NATA's review of the FCC's July 27, 1983, access charge decision reveals that business customers of communications services will not be seriously affected by its implementation. Of the $3.5 billion in access charges imposed by the Commission, only 43 percent of the total, or $1.5 billion, will fall on the business community. Moreover, preliminary AT&T estimates indicate that the FCC decision may allow for up to a 10 percent reduction in interstate calling rates, further limiting the effect on the cost of business communications requirements.

Large corporate and institutional users of existing Centrex services may find their communications costs somewhat improved by the decision, at least during the six-year transition period. The Commission's order allows all customers with Centrex systems in service or on order prior to July 27, 1983, to pay access charges at a $2 per month residential rate, rising to $4 per month by 1986. Depending on individual Centrex customer interstate usage patterns, this access charge increase may be offset by the 10 percent reduction in interstate rates made possible by the Commission's shifting a part of non-traffic sensitive cost requirements directly to customers.

Those most seriously affected by the decision are private line subscribers, resellers, sharers, enhanced service pro-

viders, and specialized common carriers. These leased line users and carriers, other than the specialized carriers, will be burdened with Special Access Surcharges of approximately $1 billion. Together, the Subscriber Charges ($3.5 billion) and the Special Access Charges ($1 billion) will generate about 42 percent ($4.5 billion) of the estimated $10.7 billion interstate revenue requirement associated with subscriber lines for 1984. If these estimates are correct, the carrier share of the subscriber line revenue requirement which must be recovered from MTS-WATS, open-end FX-CCSA (foreign exchange-common control switching arrangement), and MTS-WATS equivalent services will be $6.2 billion.

This $6.2 billion will be recovered through carrier's carrier charges, just as they are now. There will be a 35 percent differential imposed upon MTS-WATS providers to reflect the fact that the access received by MTS-WATS equivalent services is inferior to that received by true MTS-WATS providers. This differential will result in a premium charge of approximately $2.2 billion in 1984. The 35 percent differential will be reduced as exchange carriers implement equal access arrangements. Thus, while the Commission's decision retains cost differentials between competitive carriers, it seems clear that the competitive pricing differentials between alternative long distance services are now being squeezed by government policy and action.

Only facilities-based carriers will pay carrier's carrier charges. A carrier such as MCI will have its carrier charges prorated to reflect the fact that it owns some and leases others of the facilities over which it provides its services. Resellers and enhanced service providers will not pay carrier's carrier charges but will pay the surcharge of $25 per line per month imposed on users of Special Access lines.

Subscriber Access Lines by Type of Service: 1982

	LINES (000)	1984 REVENUES (est. thousands)
AMERICAN TELEPHONE & TELEGRAPH		
Main Telephones:		
Residential	58,041.2	$1,392,988.8
Business	11,340.0	816,480.0
PBX Trunks	1,724.2	124,142.4
Centrex C.O. Lines	5,329.1	127,898.4
Centrex Trunks	149.5	3,588.0
Exchange Lines Terminated in CPE:		
Residential	3,260.5	78,252.0
Business	1,552.9	111,808.8
PBX Trunks	589.3	42,429.6
Other Equivalent Main	2,627.9	63,069.6
Total AT&T	87,704.6	$2,760,657.6
SOUTHERN NEW ENGLAND & CINCINNATI BELL		
Residential	1,659.7	$ 39,832.8
Business	556.3	40,053.6
Total SNET & CBI	2,216.0	$ 79,886.4
INDEPENDENT TELEPHONE COMPANIES		
Business	2,800.6	$ 201,643.2
Centrex	371.4	8,913.6
PBX Trunks	379.3	27,309.6
Residential	17,322.6	415,742.4
Other Equivalent Main	271.7	6,520.8
Total Independents	21,145.6	$ 660,129.6
TOTAL SUBSCRIBER ACCESS LINES	108,066.2	$3,500,673.6
SPECIAL ACCESS SURCHARGES (Estimated)		$1,000,000.0
TOTAL ACCESS REVENUE		$4,500,673.6

Access lines refer to any circuit between a subscriber's telephone equipment and the telephone company's central office. AT&T has traditionally distinguished between two types of access lines, designated "main telephones" and "equivalent main" telephones. "Main telephones" refers to telco-supplied, single-line instruments connected directly to a central office. This category includes the principal telephone of each party on a party line and excludes extensions and all telephones installed behind a PBX. It is assumed that access lines terminating in telco-supplied key telephone systems are also included in this category. "Equivalent main telephones" indicates all voice grade circuits which terminate in other main telephones. This category includes PBX trunks, Centrex trunks, Centrex telephones, and all customer-provided equipment which is connected to the central office.

SOURCE: AT&T, FCC, USITA & NATA

Telephone Development in Large Exchange Areas in the United States as of January 1, 1982

NOTE: These areas are generally larger than the corporate areas of the cities they serve

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Abilene, Texas	A	64,811	29,475	94,286	132	71.6	47,379
Akron, Ohio	A	263,636	83,437	374,073	450	77.1	173,647
Albany, Georgia	A	62,557	22,028	84,585	109	77.8	38,721
Albany, New York	A	94,281	73,717	167,998	194	86.4	76,442
Albuquerque, New Mexico	A	228,025	95,910	323,935	505	64.1	172,401
Alexandria, Louisiana	A	59,750	20,409	81,159	116	69.2	40,875
Alexandria, Virginia	A	302,939	207,978	510,917	420	121.5	215,708
Alhambra, California	A	130,380	42,783	173,163	212	81.7	96,119
Allentown, Pennsylvania	A	109,806	42,233	152,039	160	95.0	72,570
Altoona, Pennsylvania	A	47,369	12,372	59,741	75	79.7	31,262
Amarillo, Texas	A	107,330	41,293	148,623	162	92.0	59,192
Anaheim, California	C	164,675	73,329	238,004	287	82.9	119,471
Anchorage, Alaska	A	NA**	NA	149,548	204	73.3	82,487
Anderson, Indiana	A	50,079	13,688	63,767	91	70.4	31,832
Ann Arbor, Michigan	A	79,405	58,632	138,037	128	107.7	56,255
Appleton, Wisconsin	A	49,629	18,730	68,359	102	67.3	35,934
Arlington, Massachusetts	A	32,001	4,692	36,693	64	57.7	22,688
Arlington, Texas	C	97,479	27,316	124,795	165	75.5	63,803
Arlington Heights, Illinois	C	89,238	26,849	116,087	122	95.2	51,546
Arvada, Colorado		(Included in Denver, Colorado, Exchange)					
Asheville, North Carolina	A	55,981	25,169	81,150	101	80.5	39,134
Athens, Georgia	A	46,867	25,273	72,140	82	88.4	32,795
Atlanta, Georgia	A	618,785	340,215	959,000	991	96.8	393,213
Augusta, Georgia	A	116,324	50,170	166,494	227	73.3	75,183
Aurora, Colorado		(Included in Denver, Colorado, Exchange)					
Aurora, Illinois	C	77,612	23,597	101,209	119	84.8	45,085
Austin, Texas	A	306,185	135,969	442,154	484	91.4	218,233
Bakersfield, California	A	158,389	51,942	210,331	293	71.8	112,293
Baltimore, Maryland	A	1,126,532	401,584	1,528,116	1,681	90.9	740,790
Baton Rouge, Louisiana	A	235,967	94,194	330,161	393	84.0	153,829
Bayonne, New Jersey	B	42,365	10,219	52,584	64	82.2	29,623
Baytown, Texas	A	NA	NA	36,874	57	64.8	19,379
Beaumont, Texas	A	76,499	31,813	108,312	118	91.8	55,534
Bellevue, Washington	A	69,609	30,052	99,661	93	107.6	48,213
Berkeley, California		(Included in East Bay, California, Exchange)					
Bethlehem, Pennsylvania	A	65,036	23,951	88,987	92	97.3	41,797
Billings, Montana	A	62,566	25,805	88,371	102	87.1	43,582
Biloxi, Mississippi	A	31,467	11,160	42,627	72	59.6	22,918

Exchange or Zone Area	Code*	Telephones: Residence	Telephones: Business	Telephones: Total	Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
Binghamton, New York	A	57,633	26,311	83,944	117	71.5	47,197
Birmingham, Alabama	A	348,336	147,681	496,017	541	91.7	227,309
Bloomington, Indiana	A	39,518	24,786	64,304	96	67.0	29,271
Bloomington, Minnesota		(Included in Minneapolis-St. Paul, Minnesota, Exchange)					
Boca Raton, Florida	A	85,293	25,079	110,372	82	133.9	51,904
Boise, Idaho	A	96,439	44,298	140,737	157	89.8	65,254
Boston, Massachusetts	C	296,323	248,566	544,889	648	84.4	249,608
Boulder, Colorado		(Included in Denver, Colorado, Exchange)					
Boynton Beach, Florida	A	41,320	6,574	47,894	62	76.7	26,885
Bradenton, Florida	A	82,601	20,154	102,215	116	88.2	66,592
Bridgeport, Connecticut	A	132,793	55,153	187,946	223	84.4	93,012
Bristol, Connecticut	A	39,591	7,453	47,044	66	71.7	27,080
Brockton, Massachusetts	A	60,681	18,005	78,686	112	70.4	42,796
Brookline, Massachusetts	C	56,454	31,980	88,434	91	96.8	42,171
Brownsville, Texas	A	39,320	16,207	55,527	95	58.4	30,518
Buena Park, California	C	38,924	17,766	56,690	75	75.6	27,151
Buffalo, New York	A	282,847	93,742	376,589	685	55.0	232,931
Burbank, California	A	78,861	51,527	130,388	125	104.3	63,691
Cambridge, Massachusetts	A	56,269	64,496	120,765	124	97.5	49,919
Camden, New Jersey	A	51,615	22,625	74,240	89	83.9	30,912
Canton, Ohio	A	100,094	28,273	128,367	175	73.3	67,159
Casper, Wyoming	A	49,837	24,589	74,426	75	99.6	35,167
Cedar Rapids, Iowa	A	96,533	34,910	131,443	149	88.1	61,372
Champaign, Illinois	A	77,508	39,336	116,844	123	95.2	51,086
Charleston, South Carolina	A	149,683	66,059	215,742	294	73.5	96,484
Charleston, West Virginia	A	78,289	42,099	120,388	136	88.6	59,061
Charlotte, North Carolina	C	279,504	128,332	407,836	404	101.1	175,383
Chattanooga, Tennessee	A	191,470	64,141	255,611	346	73.9	126,579
Chesapeake, Virginia		(Included in Norfolk, Virginia, Exchange)					
Chicago, Illinois	C	1,891,959	865,169	2,757,128	2,988	92.3	1,292,818
Chicopee, Massachusetts	C	18,134	4,562	22,696	36	63.6	14,198
Chula Vista, California	C	104,842	19,609	124,451	175	71.1	70,043
Cicero, Illinois	A	39,269	13,302	52,571	63	84.1	26,007
Cincinnati, Ohio	A	544,900	232,400	777,300	850	91.5	378,000
Clearwater, Florida	A	198,558	57,491	256,049	293	87.4	163,469
Cleveland, Ohio	A	654,653	257,592	912,245	1,091	83.6	433,838
Cleveland Hts., Ohio		(Included in Cleveland, Ohio, Exchange)					
Clifton, New Jersey		(Included in Passaic, New Jersey, Exchange)					
Colorado Spgs., Colorado	A	183,068	69,730	252,798	320	79.1	125,069
Columbia, Missouri	A	NA	NA	82,000	98	83.4	45,431
Columbia, South Carolina	A	197,168	98,061	295,229	346	85.3	128,641
Columbus, Georgia	A	105,216	39,726	144,942	198	73.1	66,248
Columbus, Ohio	C	321,326	156,273	477,599	499	95.6	213,496
Compton, California	A	189,499	90,549	280,048	356	78.7	145,606

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Concord, California	A	82,424	25,693	108,117	147	73.5	59,894
Corpus Christi, Texas	A	154,185	64,047	218,232	248	88.0	111,447
Costa Mesa, California		(Included in Newport Beach, California, Exchange)					
Council Bluffs, Iowa	A	42,453	10,320	52,773	66	79.6	26,214
Covina, California	A	262,015	74,594	336,609	433	77.7	164,166
Covington, Kentucky		(Included in Kentucky-Metropolitan, Kentucky, Exchange)					
Cranston, Rhode Island		(Included in Providence, Rhode Island, Exchange)					
Dallas, Texas	C	755,944	244,070	1,000,014	1,385	72.2	476,796
Daly City, California		(Included in San Francisco, California, Exchange)					
Danbury, Connecticut	A	63,248	26,210	89,458	102	87.5	43,412
Danville, Virginia	A	44,803	11,414	56,217	85	66.2	31,571
Davenport, Iowa	A	93,824	29,187	123,011	147	83.9	59,072
Dayton, Ohio	A	275,497	95,207	370,704	441	84.1	181,032
Daytona, Florida	A	97,811	36,832	134,643	200	67.2	73,299
Dearborn, Michigan		(Included in Detroit, Michigan, Exchange)					
Dearborn Hts., Michigan		(Included in Detroit, Michigan, Exchange)					
Decatur, Illinois	A	75,606	22,522	98,128	106	92.3	44,140
Delray Beach, Florida	A	64,519	11,174	75,693	61	123.4	40,284
Denton, Texas	A	NA	NA	45,700	50	91.8	23,594
Denver, Colorado	A	1,049,089	441,980	1,491,069	1,630	91.5	739,882
Des Moines, Iowa	A	195,688	91,981	287,669	283	101.8	123,232
Des Plaines, Illinois	A	55,422	38,316	93,738	117	80.1	46,578
Detroit, Michigan	A	1,096,229	388,511	1,484,740	1,420	104.6	689,105
Downey, California	A	211,233	84,006	295,239	360	82.0	144,119
Dubuque, Iowa	A	41,705	16,791	58,496	79	74.4	29,322
Duluth, Minnesota	A	70,439	22,528	92,967	125	74.6	49,651
Durham, North Carolina	A	90,011	44,211	134,222	157	85.8	72,738
East Bay Exchange, California	A	414,495	201,350	615,845	668	92.2	334,154
East Hartford, Connecticut		(Included in Hartford, Connecticut, Exchange)					
East Lansing, Michigan		(Included in Lansing, Michigan, Exchange)					
East Orange, New Jersey		(Included in Orange, New Jersey, Exchange)					
East St. Louis, Illinois	A	53,796	11,223	65,019	84	77.4	28,585
Eau Claire, Wisconsin	A	38,397	16,845	55,242	71	77.5	28,269
El Cajon, California	C	127,126	25,259	152,385	191	79.8	83,894
El Monte, California	A	50,075	24,767	74,842	104	72.0	41,628
El Paso, Texas	A	211,130	75,194	286,324	470	61.0	151,608
Elgin, Illinois	A	57,243	15,540	72,783	82	89.2	33,740
Elizabeth, New Jersey	A	69,497	31,419	100,916	114	88.7	50,736
Elyria, Ohio	A	45,052	11,814	56,866	61	92.6	35,497
Enid, Oklahoma	A	37,082	15,164	52,246	53	99.0	25,710
Erie, Pennsylvania	A	107,021	42,995	150,016	185	81.1	80,357
Escondido, California	A	76,211	21,193	97,404	98	99.4	54,045
Euclid, Ohio		(Included in Cleveland, Ohio, Exchange)					
Eugene-Springfield, Oregon	A	114,076	44,884	158,960	205	77.7	90,946

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Evanston, Illinois	B	61,863	25,665	87,528	74	117.5	38,446
Evansville, Indiana	A	94,275	36,581	130,856	155	84.5	63,695
Everett, Washington	A	57,754	29,016	86,770	100	86.5	44,783
Fairbanks, Alaska	A	NA	NA	38,889	54	72.0	15,283
Fairfield, California	A	43,722	15,658	59,380	85	69.9	29,471
Fairfield, Connecticut	C	26,850	6,285	33,135	35	94.4	15,936
Fall River, Massachusetts	A	68,944	16,463	85,407	123	69.5	51,199
Fargo, North Dakota – Moorehead, Minnesota	A	76,903	34,789	111,692	116	96.0	49,820
Farmington, Michigan	C	56,848	15,679	72,527	83	87.7	36,896
Farmington Hills, Michigan		(Included in Farmington, Michigan, Exchange)					
Fayetteville, North Carolina	A	108,071	35,124	143,195	251	57.0	78,228
Flint, Michigan	A	176,318	49,397	225,715	242	93.3	108,335
Florissant, Missouri	C	58,272	7,338	65,610	104	63.4	34,122
Ft. Collins, Colorado	A	55,131	21,764	76,895	104	71.4	40,371
Ft. Lauderdale, Florida	A	358,600	123,007	481,607	473	101.8	245,075
Ft. Myers, Florida	C	60,882	31,279	92,161	81	113.9	53,908
Ft. Pierce, Florida	A	38,944	13,654	52,598	63	82.9	28,481
Ft. Smith, Arkansas	A	44,509	19,029	63,538	83	76.6	34,102
Ft. Wayne, Indiana	A	120,630	62,635	183,265	255	71.9	99,533
Ft. Worth, Texas	C	253,634	114,424	368,058	401	91.8	173,913
Fountain Valley, California		(Included in Huntington Beach, California, Exchange)					
Framingham, Massachusetts	A	49,195	19,800	68,995	78	88.9	35,437
Fremont City, California	A	123,247	28,128	151,375	228	66.7	84,567
Fresno, California	A	217,575	77,320	294,895	379	77.8	154,114
Fullerton, California	C	65,553	41,178	106,731	89	119.9	46,536
Gadsden, Alabama	A	46,532	11,189	57,721	83	69.2	30,992
Gainesville, Florida	A	71,552	37,206	108,758	139	78.2	50,411
Galveston, Texas	A	38,893	19,818	58,711	62	94.8	29,718
Garden Grove, California	C	73,510	17,765	91,275	119	76.7	50,299
Garland, Texas	C	NA	NA	95,950	140	68.4	47,981
Gary, Indiana	A	73,860	17,458	91,318	183	49.9	36,587
Gastonia, North Carolina	A	55,670	15,645	71,315	88	80.9	33,997
Glendale, Arizona		(Included in Phoenix, Arizona, Exchange)					
Glendale, California	A	78,152	35,500	113,652	112	101.5	62,044
Grand Prairie, Texas	C	46,413	27,122	73,535	82	89.8	31,558
Grand Rapids, Michigan	A	243,253	76,098	319,351	385	83.0	161,181
Great Falls, Montana	A	43,215	18,192	61,407	79	77.3	30,282
Greeley, Colorado	A	40,402	15,410	55,812	73	76.0	28,180
Green Bay, Wisconsin	A	72,292	27,514	99,806	150	66.5	54,397
Greensboro, North Carolina	A	154,531	64,594	219,125	212	103.6	95,214
Greenville, South Carolina	A	132,976	53,811	186,787	252	74.3	87,867
Gulfport, Mississippi	A	47,406	16,207	63,613	99	64.3	32,278

Exchange or Zone Area	Code*	Telephones Residence	Business	Total	Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
Hamden, Connecticut		(Included in New Haven, Connecticut, Exchange)					
Hamilton, Ohio	A	97,600	22,200	119,800	160	74.9	63,800
Hammond, Indiana	A	61,424	11,686	73,110	106	68.7	35,770
Hampton, Virginia		(Included in Newport News, Virginia, Exchange)					
Harrisburg, Pennsylvania	A	145,680	71,484	217,164	186	116.8	93,389
Hartford, Connecticut	A	205,024	130,110	335,134	336	99.7	142,112
Hawthorne, California	A	47,423	42,848	90,271	89	101.4	38,793
Hayward, California	A	117,967	41,319	159,286	214	74.4	89,961
Hialeah, Florida		(Included in Miami, Florida, Exchange)					
High Point, North Carolina	A	61,522	23,569	85,091	111	76.8	46,552
Hollywood, Florida	A	217,513	44,793	262,306	303	86.5	138,716
Honolulu, Hawaii	A	NA	NA	403,821	373	108.3	219,086
Houma, Louisiana	A	42,233	16,646	58,879	87	67.5	30,444
Houston, Texas	A	965,724	597,266	1,562,990	1,618	96.6	785,614
Huntington, West Virginia	A	62,456	24,190	86,646	118	73.7	47,943
Huntington Beach, California	C	133,522	25,101	158,623	170	93.3	82,764
Huntsville, Alabama	A	101,963	55,119	157,082	185	84.9	66,478
Independence, Missouri	C	53,492	10,464	63,956	85	75.6	35,341
Indianapolis, Indiana	C	463,468	192,832	656,300	758	86.5	275,031
Inglewood, California	A	88,535	61,125	149,660	147	101.8	71,882
Irvine, California		(Included in Newport Beach, California, Exchange)					
Irving, Texas	A	NA	NA	92,265	111	83.0	48,724
Jackson, Mississippi	A	157,701	74,484	232,185	282	82.4	102,164
Jacksonville, Florida	D	319,278	129,557	448,835	572	78.5	206,641
Janesville, Wisconsin	A	33,905	9,901	43,806	61	72.2	24,394
Jersey City, New Jersey	A	143,105	49,345	192,450	262	73.5	103,444
Joliet, Illinois	A	79,440	24,306	103,746	120	86.4	46,954
Kalamazoo, Michigan	A	115,896	49,451	165,347	183	90.2	75,309
Kansas City, Kansas	A	126,893	44,873	171,766	189	90.7	80,121
Kansas City, Missouri	C	192,207	143,190	335,397	285	117.9	135,083
Kenner, Louisiana	A	74,765	13,207	87,972	121	72.8	46,480
Kenosha, Wisconsin	A	50,875	14,557	65,432	91	71.5	35,762
Kentucky-Metro., Kentucky	A	104,900	21,500	126,400	172	73.5	70,900
Kettering, Ohio		(Included in Dayton, Ohio, Exchange)					
Knoxville, Tennessee	A	163,544	70,494	234,038	298	78.6	117,148
La Mesa, California	C	112,081	19,550	131,631	180	73.1	73,214
Lafayette, Louisiana	A	76,392	39,821	116,213	122	95.3	58,022
Lake Charles, Louisiana	A	71,589	26,224	97,813	118	83.1	49,932
Lakeland, Florida	A	75,778	24,045	99,823	137	72.8	61,203
Lakewood, Colorado		(Included in Denver, Colorado, Exchange)					
Lakewood, Ohio		(Included in Cleveland, Ohio, Exchange)					
Lancaster, California	A	37,641	11,977	49,618	71	69.9	25,818
Lancaster, Pennsylvania	A	80,908	33,018	113,926	114	99.9	53,887
Lansing, Michigan	A	148,873	88,648	237,521	254	93.6	98,667

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Laredo, Texas	A	39,188	18,091	57,279	104	55.1	30,743
Las Vegas, Nevada	A	289,060	118,000	407,060	391	104.1	180,718
Lawrence, Kansas	A	34,921	15,414	50,335	56	89.4	24,083
Lawrence, Massachusetts	A	63,461	23,917	87,378	129	67.9	49,250
Lawton, Oklahoma	A	51,513	13,516	65,029	113	57.4	35,178
Lexington, Kentucky	A	120,501	60,944	181,445	208	87.2	101,887
Lima, Ohio	A	40,101	20,230	60,331	83	72.7	33,685
Lincoln, Nebraska	A	114,907	59,210	174,117	193	90.3	83,550
Little Rock, Arkansas	A	155,359	74,718	230,077	293	78.7	111,187
Livonia, Michigan	A	89,947	26,217	116,164	138	84.5	58,219
Long Beach, California	C	272,102	112,192	384,294	451	85.2	211,956
Longview, Texas	A	57,805	22,146	79,951	108	74.0	39,948
Lorain, Ohio	B	41,831	9,569	51,400	89	57.8	34,215
Los Angeles, California	A	1,289,102	689,459	1,978,561	1,800	109.9	850,993
Louisville, Kentucky	A	430,580	141,123	571,703	680	84.1	284,927
Lowell, Massachusetts	A	85,349	28,172	113,521	175	64.8	61,336
Lubbock, Texas	A	118,732	55,531	174,263	190	91.8	77,463
Lynchburg, Virginia	A	65,583	22,044	87,627	115	76.4	46,122
Lynn, Massachusetts	A	59,703	19,900	79,603	110	72.3	43,090
Macon, Georgia	A	92,020	31,209	123,229	156	78.9	59,763
Madison, Wisconsin	A	120,636	74,733	195,369	211	92.6	95,334
Malden, Massachusetts	C	32,451	7,670	40,121	55	72.4	24,386
Manchester, New Hampshire	A	58,748	26,850	85,598	101	84.5	45,403
Mansfield, Ohio	A	46,134	20,066	66,200	88	74.8	37,464
Medford, Massachusetts	C	29,465	5,585	35,050	62	56.2	22,077
Memphis, Tennessee	A	485,805	154,626	640,431	809	79.2	310,914
Meriden, Connecticut	A	33,517	9,432	42,949	58	74.1	23,685
Mesa, Arizona		(Included in Phoenix, Arizona, Exchange)					
Miami, Florida	A	88,429	376,681	1,265,110	1,405	90.1	572,594
Miami Beach, Florida		(Included in Miami, Florida, Exchange)					
Middletown, Ohio	A	35,743	10,877	46,620	68	68.7	24,252
Midland, Texas	C	62,230	32,583	94,813	88	108.0	41,593
Midwest City, Oklahoma		(Included in Oklahoma City, Oklahoma, Exchange)					
Milford, Connecticut	A	33,407	9,665	43,072	52	83.3	22,441
Milton, Massachusetts	C	32,109	3,894	36,003	55	66.1	18,641
Milwaukee, Wisconsin	A	618,610	255,108	873,718	1,176	74.3	465,315
Minneapolis-St. Paul, Minnesota	A	1,205,059	492,408	1,697,467	1,722	98.6	798,004
Mobile, Alabama	A	200,463	58,138	258,601	363	71.2	132,665
Modesto, California	A	108,485	32,987	141,472	196	72.2	75,608
Monroe, Louisiana	A	75,951	26,869	102,820	137	75.3	51,013
Montebello, California	A	48,090	34,270	82,360	83	99.2	41,380

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Montgomery, Alabama	A	123,802	46,072	169,874	206	82.6	81,789
Mountain View, California	C	52,657	31,816	84,473	93	90.8	41,806
Mt. Prospect, Illinois		(Included in Arlington Heights, Illinois, Exchange)					
Mt. Vernon, New York	A	97,246	17,980	115,226	160	72.1	69,229
Muncie, Indiana	A	56,023	23,143	79,166	107	73.8	38,206
Muskegon, Michigan	A	61,685	22,402	84,807	120	70.5	51,785
Napa, California	A	45,264	13,032	58,296	77	75.7	31,541
Nashua, New Hampshire	A	51,568	27,517	79,085	92	86.4	36,534
Nashville, Tennessee	A	301,199	124,704	425,903	511	83.3	204,489
National City, California	C	54,549	9,213	63,762	96	66.4	35,632
New Bedford, Massachusetts	A	77,762	20,634	98,396	149	65.8	58,906
New Britain, Connecticut	A	49,330	13,026	62,356	88	70.6	37,038
New Haven, Connecticut	A	199,495	83,219	282,714	301	94.1	132,990
New Iberia, Louisiana	A	30,142	9,613	39,755	55	72.9	21,313
New Orleans, Louisiana	A	583,814	217,226	801,040	996	80.4	404,237
New Rochelle, New York	D	53,267	12,179	65,446	71	91.9	37,330
New York, New York	B	3,962,094	1,788,912	5,751,006	7,073	81.3	3,194,924
Newark, New Jersey	A	213,323	117,659	330,982	409	80.8	152,395
Newport Beach, California	C	98,230	37,806	136,036	124	109.7	69,525
Newport News Metro Area, Virginia	C	165,104	54,976	220,080	277	79.6	113,328
Newton, Massachusetts	D	61,636	18,520	80,156	98	81.6	40,380
Niagara Falls, New York	A	42,683	15,303	57,986	98	59.1	34,281
Norfolk Metro Area, Virginia	C	384,300	126,862	511,162	722	70.8	260,354
Norman, Oklahoma		(Included in Oklahoma City, Oklahoma, Exchange)					
North Little Rock, Arkansas		(Included in Little Rock, Arkansas, Exchange)					
Norwalk, Connecticut	B	52,400	22,834	75,234	78	97.0	35,524
Oak Lawn, Illinois	A	111,763	21,499	133,262	166	80.3	65,871
Oak Park, Illinois	B	46,377	10,617	56,994	56	101.3	27,079
Oakland, California		(Included in East Bay, California, Exchange)					
Oceanside, California	C	63,580	16,348	79,928	139	60.2	44,665
Odessa, Texas	A	78,446	31,235	109,681	123	89.5	52,203
Ogden, Utah	A	74,852	20,640	95,492	155	61.3	48,327
Oklahoma City, Oklahoma	A	517,148	214,770	731,918	783	93.4	348,945
Omaha, Nebraska	A	373,932	131,043	504,975	480	105.3	224,754
Ontario, California	A	121,314	30,664	151,978	159	95.6	78,209
Orange, California	C	100,911	42,870	143,781	161	89.3	68,847
Orange, New Jersey	A	108,020	29,228	137,248	146	94.2	68,894
Orlando, Florida	A	196,049	101,136	297,185	348	85.4	142,432
Overland Park, Kansas	C	120,496	31,740	152,236	152	100.5	66,157
Owensboro, Kentucky	A	36,504	14,146	50,650	68	74.5	27,290
Oxnard, California	A	104,919	34,037	138,956	187	74.3	72,256
Palo Alto, California	A	87,704	77,039	164,743	141	116.8	70,275

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Parkersburg, West Virginia	A	42,556	15,591	58,147	84	69.6	32,050
Parma, Ohio	A	63,665	10,121	73,786	102	72.3	41,577
Pasadena, California	A	144,501	70,015	214,516	209	102.6	102,335
Pasadena, Texas		(Included in Houston, Texas, Exchange)					
Passaic, New Jersey	A	112,665	35,201	147,866	180	82.4	84,934
Paterson, New Jersey	A	100,204	30,779	130,983	179	73.2	67,069
Pawtucket, Rhode Island	A	76,929	18,904	95,833	142	67.5	57,536
Pensacola, Florida	A	120,932	45,157	166,089	245	67.8	78,842
Peoria, Illinois	A	150,999	54,386	205,385	206	99.5	86,749
Petersburg, Virginia	A	51,387	11,865	63,252	101	62.6	34,838
Philadelphia, Pennsylvania	B	1,259,131	450,982	1,710,113	1,670	102.4	740,323
Phoenix, Arizona	A	1,006,386	331,187	1,337,573	1,522	87.9	687,840
Pine Bluff, Arkansas	A	40,430	12,468	52,898	82	64.2	28,934
Pittsburgh, Pennsylvania	A	554,214	264,427	818,641	850	96.3	371,345
Pittsfield, Massachusetts	A	33,489	13,955	47,444	55	86.4	24,004
Plano, Texas	C	NA	NA	62,733	76	82.1	31,083
Pomona, California	A	184,466	59,884	244,350	236	103.5	119,481
Pompano Beach, Florida	A	174,060	34,584	208,644	229	91.1	110,130
Pontiac, Michigan	A	96,008	35,686	131,694	145	90.5	60,136
Port Arthur, Texas	A	45,393	12,642	58,035	74	79.0	32,324
Portland, Maine	C	33,447	24,572	58,019	62	93.3	27,897
Portland, Oregon	A	331,874	196,100	527,974	513	102.8	269,755
Portsmouth, Virginia		(Included in Norfolk, Virginia, Exchange)					
Provo-Orem, Utah	A	62,635	20,293	82,928	152	54.4	41,923
Providence, Rhode Island	A	196,678	92,284	288,962	350	82.6	147,613
Pueblo, Colorado	A	65,240	21,697	86,937	124	70.4	47,736
Quincy, Massachusetts	A	51,764	19,008	70,772	87	81.8	39,395
Racine, Wisconsin	A	72,204	23,826	96,030	126	76.5	51,408
Raleigh, North Carolina	A	153,041	76,888	229,929	232	99.1	96,861
Reading, Pennsylvania	A	119,835	38,913	158,748	185	85.9	77,948
Redondo Beach, California	C	174,045	45,892	219,937	257	85.6	118,123
Redwood City, California	A	46,325	19,878	66,203	80	82.8	37,330
Reno, Nevada	A	119,980	66,886	186,866	192	97.3	85,097
Richardson, Texas	C	72,954	41,127	114,081	113	100.7	45,987
Richmond, California	A	78,189	20,949	99,138	141	70.3	57,041
Richmond, Virginia	A	290,700	124,697	415,397	454	91.5	195,470
Riverside, California	C	150,078	46,784	196,862	271	72.6	99,362
Roanoke, Virginia	A	99,359	33,462	132,821	193	68.9	69,878
Rochester, Minnesota	A	45,960	32,573	78,533	78	100.8	31,563
Rochester, New York	A	215,213	97,657	312,870	534	58.6	168,129
Rockford, Illinois	A	153,519	48,696	202,215	210	96.2	87,527
Rome, Georgia	A	45,297	14,202	59,499	78	76.6	29,892

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Roseville, Michigan	A	134,052	24,680	158,732	213	74.4	88,470
Royal Oak, Michigan	A	163,611	53,453	217,064	225	96.5	113,878
Sacramento, California	C	412,227	189,243	601,470	715	84.8	301,129
Saginaw, Michigan	A	105,476	32,289	137,765	178	77.3	68,674
St. Clair Shores, Michigan		(Included in Roseville, Michigan, Exchange)					
St. Joseph, Missouri	A	50,555	16,681	67,236	79	85.5	35,014
St. Louis, Missouri	C	386,959	202,097	589,056	640	92.0	273,690
St. Paul, Minnesota		(Included in Minneapolis-St. Paul, Minnesota, Exchange)					
St. Petersburg, Florida	A	255,516	79,205	334,721	401	83.5	219,002
Salem, Oregon	A	88,117	35,523	123,640	158	78.0	66,341
Salinas, California	A	58,177	21,002	79,179	107	74.0	42,290
Salt Lake City, Utah	A	412,784	146,130	558,914	731	76.5	258,726
San Angelo, Texas	A	NA	NA	71,799	74	96.5	34,527
San Antonio, Texas	C	303,875	125,655	429,530	684	62.8	224,136
San Bernadino, California	C	77,266	34,450	111,716	156	71.6	56,554
San Diego, California	A	357,972	204,049	562,021	638	88.1	281,844
San Francisco, California	A	494,310	397,705	892,015	782	114.4	444,075
San Jose, California	A	492,057	215,635	707,692	905	78.2	357,406
San Mateo, California	A	101,783	39,199	140,982	158	89.2	75,883
Santa Ana, California	C	369,782	214,199	583,981	513	113.8	273,607
Santa Barbara, California	A	103,492	52,878	156,370	152	102.9	78,333
Santa Clara, California		(Included in San Jose, California, Exchange)					
Santa Monica, California	A	189,124	91,615	280,739	250	112.3	144,273
Santa Rosa, California	A	90,682	32,106	122,788	147	83.5	67,136
Sarasota, Florida	A	115,115	38,988	154,103	143	107.5	91,505
Savannah, Georgia	A	116,615	42,495	159,110	217	73.4	77,410
Schaumburg, Illinois	A	101,622	25,042	126,664	136	92.9	55,966
Schenectady, New York	A	96,606	31,642	128,248	171	74.8	73,662
Scottsdale, Arizona		(Included in Phoenix, Arizona, Exchange)					
Scranton, Pennsylvania	A	69,153	24,514	93,667	106	88.6	48,632
Seattle, Washington	A	422,134	274,982	697,116	580	120.1	349,110
Shreveport, Louisiana	A	175,538	62,842	238,380	310	77.0	118,169
Simi, California	A	49,379	7,977	57,356	94	61.0	30,017
Sioux City, Iowa	A	56,625	20,226	76,851	99	77.8	36,921
Sioux Falls, South Dakota	A	61,090	25,592	86,682	91	95.2	39,649
Skokie, Illinois	A	110,266	46,472	156,738	120	130.2	62,865
Slidell, Louisiana	A	5,696	31,302	36,998	50	73.7	19,894
Somerville, Massachusetts	C	41,760	9,005	50,765	89	57.0	34,237
South Bend, Indiana	A	102,803	42,157	144,960	176	82.3	67,274
South San Francisco, California	A	56,942	32,204	89,146	109	81.8	45,575
Southfield, Michigan	C	69,213	56,993	126,206	72	174.2	51,879
Spartanburg, South Carolina	A	72,567	26,596	99,163	146	67.9	48,165
Spokane, Washington	A	178,708	64,267	242,975	262	92.6	135,595

Exchange or Zone Area	Code*	Telephones			Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
		Residence	Business	Total			
Springfield, Illinois	A	109,242	52,241	161,483	141	114.6	63,543
Springfield, Massachusetts	A	117,243	41,672	158,915	211	75.4	86,416
Springfield, Missouri	A	98,275	38,058	136,333	153	89.0	70,592
Springfield, Ohio	A	59,390	15,494	74,884	111	67.6	40,527
Stamford, Connecticut	A	77,594	45,418	123,012	102	120.4	52,836
Sterling Heights, Michigan		(Included in Warren, Michigan, Exchange)					
Stockton, California	A	127,993	40,987	168,980	259	65.2	92,219
Stratford, Connecticut		(Included in Bridgeport, Connecticut, Exchange)					
Sunnyvale, California	C	66,452	70,948	137,400	112	122.7	53,192
Syracuse, New York	A	162,577	71,674	234,251	339	69.0	130,533
Tacoma, Washington	A	197,028	64,334	261,362	291	89.7	148,079
Tallahassee, Florida	A	80,301	48,505	128,806	150	85.9	76,855
Tampa, Florida	A	338,105	145,885	483,990	628	77.0	294,108
Taunton, Massachusetts	A	31,805	7,647	39,452	56	70.0	22,549
Taylor, Michigan		(Included in Detroit, Michigan, Exchange)					
Tempe, Arizona		(Included in Phoenix, Arizona, Exchange)					
Terre Haute, Indiana	A	51,459	27,010	78,469	111	70.9	42,119
Texarkana, Texas	A	NA	NA	64,557	53	122.6	33,202
Thousand Oaks, California	C	63,522	21,290	84,812	98	86.5	39,206
Toledo, Ohio	A	232,625	82,753	315,378	428	73.7	161,019
Topeka, Kansas	A	109,040	44,449	153,489	149	103.1	68,339
Torrance, California	C	22,112	18,826	40,938	43	95.2	19,572
Trenton, New Jersey	A	68,188	40,772	108,960	142	76.8	46,107
Troy, Michigan	D	21,391	8,173	29,564	30	99.1	14,629
Troy, New York	A	61,225	14,301	75,526	139	54.1	50,098
Tucson, Arizona	A	319,088	104,487	423,575	526	80.5	226,386
Tulsa, Oklahoma	C	318,022	144,396	462,418	524	88.2	221,882
Tuscaloosa, Alabama	A	71,299	23,852	95,151	134	71.3	48,903
Tyler, Texas	A	63,529	25,513	89,042	119	75.1	43,598
Union City, New Jersey	A	109,684	30,735	140,419	172	81.4	80,349
Utica, New York	A	64,070	22,142	86,212	142	60.9	52,286
Valdosta, Georgia	A	31,621	13,811	45,432	60	75.2	21,693
Vallejo, California	A	53,509	18,233	71,742	99	72.5	36,943
Ventura, California	C	45,288	23,233	68,521	70	97.9	36,541
Vineland, New Jersey	C	39,800	12,619	52,419	70	75.0	26,464
Virginia Beach, Virginia		(Included in Norfolk, Virginia, Exchange)					
Visalia, California	A	46,014	15,940	61,954	77	80.5	32,789
Waco, Texas	A	98,614	34,426	133,040	178	74.7	68,927
Walnut Creek, California	A	72,335	27,210	99,545	112	88.9	51,917
Waltham, Massachusetts	C	40,476	35,586	76,062	80	95.2	32,087
Warren, Michigan	A	127,183	56,488	183,671	228	80.6	83,177
Warren, Ohio	A	55,508	23,558	79,066	110	72.0	44,183
Warwick, Rhode Island	A	32,882	8,796	41,678	62	67.7	23,094
Washington, D.C.	B	511,118	580,669	1,091,787	631	173.0	344,417

Exchange or Zone Area	Code*	Telephones: Residence	Telephones: Business	Telephones: Total	Population (000)	Telephones (Per 100 Pop.)	Total Main Telephones
Waterbury, Connecticut	A	67,663	23,458	91,121	116	78.4	47,851
Waterloo, Iowa	A	57,035	20,660	77,695	93	84.0	36,676
Waukegan, Illinois	A	75,390	33,816	109,206	120	91.3	45,549
Waukesha, Wisconsin	A	37,720	15,311	53,031	69	77.1	27,151
Wauwatosa, Wisconsin		(Included in Milwaukee, Wisconsin, Exchange)					
Wayne, Michigan	C	63,925	14,164	78,089	114	68.3	39,736
West Allis, Wisconsin		(Included in Milwaukee, Wisconsin, Exchange)					
West Hartford, Connecticut		(Included in Hartford, Connecticut, Exchange)					
West Haven, Connecticut		(Included in New Haven, Connecticut, Exchange)					
West Palm Beach, Florida	A	288,785	87,120	375,905	331	113.4	191,078
Westland, Michigan		(Included in Wayne, Michigan, Exchange)					
Westminster, California	C	70,227	32,856	103,083	142	72.6	49,786
Westminster, Colorado		(Included in Denver, Colorado, Exchange)					
Weymouth, Massachusetts	A	30,994	5,364	36,358	58	62.4	22,102
Wheeling, West Virginia	A	37,533	15,225	52,758	67	79.0	27,906
White Plains, New York	A	54,509	63,995	118,504	100	118.7	45,300
Whittier, California	A	163,124	52,027	215,151	287	75.5	109,414
Wichita, Kansas	A	173,371	78,138	251,509	397	63.4	116,878
Wichita Falls, Texas	C	60,573	26,795	87,368	127	68.9	43,509
Wilkes-Barre, Pennsylvania	A	53,411	19,828	73,239	87	84.2	38,286
Wilmington, Delaware	A	136,439	75,916	212,355	223	95.1	86,761
Wilmington, North Carolina	A	62,264	21,431	83,695	100	84.0	39,476
Winston-Salem, North Carolina	C	140,410	54,989	195,399	220	88.7	83,994
Winter Park, Florida	A	124,121	50,872	174,993	195	89.7	94,650
Worcester, Massachusetts	A	101,177	43,790	144,967	185	78.4	78,265
Wyoming, Michigan		(Included in Grand Rapids, Michigan, Exchange)					
Yonkers, New York	D	65,955	15,651	81,606	129	63.1	52,478
York, Pennsylvania	A	76,068	36,742	112,810	121	93.2	58,320
Youngstown, Ohio	A	153,326	35,228	188,554	261	72.3	98,817

***EXTENT OF EXCHANGE**

A Serves entire city and beyond city
B Serves entire city, but not beyond
C Does not serve entire city, but also serves beyond city
D Does not serve entire city, and does not extend beyond

SOURCE: American Telephone & Telegraph Co.
** NA, Not Available

U.S. Balance Of Trade In Telephone And Telephone Switching Equipment: 1982

($000)

IMPORTS	SWITCHING & SWITCHBOARD EQUIPMENT	TELEPHONE INSTRUMENTS	OTHER TELEPHONE APPARATUS	TOTAL
JAPAN	$ 87,920	$ 45,192	$ 52,935	$186,047
CANADA	51,911	13,831	59,602	125,344
WEST EUROPE (EEC)	3,025	1,882	10,890	15,797
SWEDEN	2,972	114	1,230	4,316
LATIN AMERICA	5,781	504	2,779	9,064
ISRAEL	11,823	51	10,282	22,156
FAR EAST (EXCLUDING JAPAN)	3,937	73,799	11,909	89,645
OTHER	250	638	2,087	2,975
TOTAL	$167,619	$136,011	$151,714	$455,344
EXPORTS				
JAPAN	$ 1,013	$ 1,209	$ 4,869	$ 7,091
CANADA	28,965	5,414	42,336	76,715
WEST EUROPE (EEC)	20,665	2,380	81,676	104,721
SWEDEN	3,338	187	1,695	5,220
LATIN AMERICA	35,597	6,562	57,339	99,498
ISRAEL	10,518	552	2,743	13,813
MIDEAST (EXCLUDING ISRAEL)	25,376	4,381	23,976	53,733
FAR EAST (EXCLUDING JAPAN)	224,901	1,798	25,399	252,098
OTHER	28,531	1,776	34,645	64,952
TOTAL	$378,904	$24,259	$274,678	$677,841

Figures show a net U.S. surplus for 1982 of $222.5 million for telephone equipment, up from $116.5 in 1981. Imports grew by 11.9 percent in 1982, while exports expanded by 29.5 percent. Japan accounted for the largest share of U.S. imports, with 41 percent of the total, followed by Canada with 28 percent and the Far East (excluding Japan) with 20 percent. The major export markets for U.S. equipment were the Far East (excluding Japan), with 37 percent of the total, Western Europe, and Latin America, each with approximately 15 percent.

Imports and exports of all wireline communications equipment (SIC. 3661), including telephone (shown above), plus telegraph and intercom equipment, were $626.3 million and $829.1 million, respectively, with a net surplus of $202.8 million.

SOURCE: U.S. Department of Commerce

Glossary

American Bell—The original name of the unregulated subsidiary set up to market new telephone equipment for the entire Bell System after January 1, 1983, and for AT&T (minus the BOCs) after divestiture in early 1984. Because of modifications in the divestiture agreement, AT&T had to drop the "Bell" from the names of all of its subsidiaries except Bell Laboratories and subsidiaries outside the United States. In August 1983, American Bell was renamed *AT&T Information Systems*.

BOCs—Bell Operating Companies. The 22 local operating companies that will be divested from AT&T in early 1984 and reorganized into seven Regional Operating Companies (ROCs). Before divestiture, they will be limited to marketing equipment in use and in inventory. After divestiture, they will be allowed to market, but not manufacture, new equipment.

Business Telephone Instruments—All telephones located on business premises, including phone sets associated with Centrex, PBX, and key systems, as well as single-line installations.

Carrier Instruments—Telephone instruments provided by either Bell or the more than 1,400 independent telephone companies.

Centrex—Central office equipment used by local operating companies to provide an alternative to PBX service. There are two generic types of Centrex service:

Centrex CO indicates the operating company has dedicated a portion of its regular central office to an individual customer, providing direct connections to the individual telephones on the customer's premises.

Centrex CU indicates the operating company has built a special central office on the customer's property to provide service.

Churn—Refers to shipments installed as replacement of old equipment without any net change in the installed base of equipment.

Electromechanical—Refers to equipment (PBX and key) which incorporates mechanical switches and relays.

Electronic—PBX and key systems (EKTS, EPBX) which have replaced the older mechanical switches and relays with solid-state microprocessor "chips."

Embedded Base—Refers to all Bell-supplied equipment in-place on customers' premises as of January 1, 1983. This equipment will be transferred from the Bell Operating Companies to AT&T at the time of divestiture.

Hybrid—An industry term referring to a telecommunications system offering characteristics of both key and PBX equipment.

Independent—The more than 1,400 independent, non-Bell telephone companies, such as United, Continental, and Centel.

Installed Base—Telephone equipment currently installed and in use.

Instrument—Individual telephone set. Either a single-line installation or connected to a Centrex, PBX, or key system. This study measures instruments roughly in terms of lines actually in use, not in terms of a system's capacity.

Interconnect—The approximately 2,300 non-telephone company suppliers of business telephone instruments.

Key—Multi-line telephone designed to provide pushbutton selection of a specific line from several incoming lines.

Local Area Network (LAN)—A digital data network designed to provide short-haul connections between distributed users.

Migration Strategy—AT&T's pricing plan designed to force existing customers to replace their old Bell equipment with new equipment.

One-A-2 (1A2) Key—A generic term referring to an early, low-featured electromechanical key system.

Original Equipment Manufacturer (OEM)—A manufacturer which distributes its product, often on an exclusive basis, through marketing companies which provide the equipment under their own name.

PBX—Private Branch Exchange. A private telephone switching system, located on a customer's premises. A PBX is connected to a common group of incoming lines and provides service to a number of individual telephone sets.

Protective Connecting Arrangement (PCA)—A device leased from the telephone company as an interface between customer-provided equipment and the public telephone network. PCAs were required by telephone companies during the period between the Carterfone decision and the establishment of the FCC's Registration Program. The monthly lease charges for PCAs constituted an effective economic barrier to customers' providing their own equipment.

Regional Operating Companies (ROCs)—The seven holding companies into which the Bell Operating Companies will be regrouped following divestiture.

Registration Program—An FCC program which permits the direct connection of terminal equipment, whether customer-provided or telco-provided, to the public telephone network without the need for protective connecting arrangements. The technical standards for direct connection are contained in *Part 68* of the FCC's *Rules and Regulations*.

Single-Line Installation—A business telephone instrument providing direct access to the telephone network and not connected to a Centrex, PBX, or key system.

Stand-Alone—A key system directly connected to the telephone network, as opposed to a key system located behind a PBX or Centrex system.

Stored Program Control—Refers to a PBX or key system that is controlled by computer technology and software programs.

System—Refers to an entire PBX, key, or Centrex installation, including all individual telephone instruments, wire, cable, and common equipment (switch for PBX and main distribution frame for key).